ALCOHOL
AND
HUMAN LIFE

C. C. WEEKS

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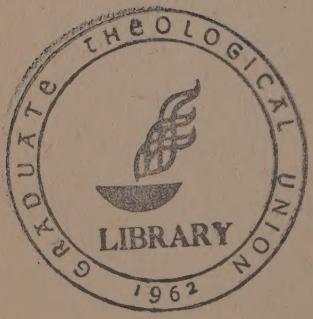
ALCOHOL AND HUMAN LIFE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ALCOHOL AND HUMAN LIFE

BEING PARTLY A REVISION OF CERTAIN FACTS AND FIGURES IN THE LAST EDITION OF "ALCOHOL AND THE HUMAN BODY," BY THE LATE SIR VICTOR HORSLEY AND THE LATE DR. MARY STURGE AND OTHERS

BY

COURTENAY C. WEEKS

M.R.C.S., L.R.C.P.

WITH FOREWORD BY

SIR THOMAS BARLOW, BART.

F.R.C.P., M.D., F.R.S.

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TO

LADY HORSLEY

IN ADMIRATION OF THE WAY IN WHICH SHE HAS 'CARRIED ON' IN THE CAUSES OF TEMPERANCE, PEACE, AND WOMANHOOD, SINCE JULY 16TH, 1916

'Don't worry about me—I can't live for ever—
it's the young who matter.'

5135

FOREWORD

By Sir Thomas Barlow, Bt., M.D., F.R.S.

I COMMEND to my medical brethren this book on the medical side of the alcohol question by my old pupil and friend, Dr. Courtenay C. Weeks. He has spared no pains to make it accurate and comprehensive. It is extremely candid and moderate in statement, and it could not be more terse and lucid in style.

A great deal of this book has gone through the mill of oral exposition, and I am confident it will repay careful perusal and frequent reference.

T. B.

March 1929.

PREFACE

I LITTLE thought when watching Horsley in his great operations thirty-five years ago, that I should be asked to attempt to hand on the Torch which he and the late Dr. Mary Sturge so effectually lighted and carried from 1907 until their deaths. But so it was: I was asked to revise and re-edit *Alcohol and the Human Body*. The whole of last summer's holiday was given to the task, only to find on its completion that the cost of publication would place it quite beyond the reach of the average social worker. Consequently, these chapters represent the salient revision of certain facts and figures, with some additional matter. It is hoped that those who possess the last edition of the book will, by means of these brief chapters, be able to bring it up to date, and that others will find herein facts worthy of their consideration.

When the book was first published we were consuming a vast amount of absolute alcohol in the form of beverage, to-day it has been reduced to 51,500,000 gallons. Then, there was a generation around us bearing the very obvious stigmata such as previous alcoholism had produced; to-day we are reaping the harvest of strenuous endeavor and wise restrictive legislation.

Then, maternal and child welfare work was hardly known, housing was even worse than it is to-day, there

was no national health insurance; to-day all these things, with others, are having a profound effect.

Then, 'public houses' were open for 19 hours, to-day for 8 to 9½; then, 185,892 convictions for drunkenness, now 65,166; then, 20 per cent. of direct admissions to mental hospitals were for alcoholic disease, now 6 per cent.; then, 90 per cent. of the cases of cruelty to children were alleged to be due to 'drink,' now 11 per cent.; then, alcohol was freely used in hospital treatment of disease, now there is a universal increase in its disuse.

Consequently, the effect of alcoholism in the national life was far more immediately obvious than to-day, the shadows cast by 'drink' were in many ways deeper, tragedy was more on the surface, and statements which were true then, need some modification in the light and experience of to-day. Some readers may think many of the statements in this little book are too cautious. The caution is not the outcome of any doubt as to the ghastly evil of alcohlism in our national life, but of the restraint which is necessary if, as the *Syllabus on Food and Drink* says (and for myself it is the most difficult part), "the subject should be dealt with in a dispassionate manner," with appeal to common sense. When one looks at the mass of evidence, part of which we have tried to incorporate in this book, when one looks at the flotsam and jetsam thrown on the shores of alcoholic indulgence, one hopes that these chapters have reflected something of the caution begotten of a deep conviction, that in spite of all our gains and all our improvement, alcoholic indulgence is still the greatest single enemy Britain has to fear, one which allies itself with all that mars and spoils human life.

To many correspondents, to the many officials who have so freely helped me, to Lady Horsley and the Executors of Dr. Mary Sturge for their confidence, and to my wife who sacrified a holiday whilst the book was attempted I tender grateful thanks.

COURTENAY C. WEEKS.

4 Oakhill Road,
Beckenham, Kent.

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ALCOHOL
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CHAPTER I

THE USE OF ALCOHOL IN MEDICAL TREATMENT

One of the most marked features of the earlier editions of *Alcohol and the Human Body* was the evidence concerning the growing reduction in the use of alcohol as a therapeutic agent. Since 1920, there have been expressions of medical opinion and facts of hospital practice which have confirmed very fully the position then taken.

In October, 1924, *The Practitioner* devoted the whole issue to the consideration of alcohol from various points of view.

With regard to the question of alcoholic indulgence as a whole, the editor said, "The subject is one of supreme importance to civilized humanity and, as a national question, is of momentous concern to every class in the community."

The subject of 'Alcohol in Medicine' was dealt with by Sir Humphry Rolleston, Bart., K.C.B., M.D., etc., President of the Royal College of Physicians. It was a balanced survey of the arguments for and against the use of alcohol. Sir Humphry recognized that there is a place for alcohol in the treatement of disease, based, as he said, "on clinical observation by innumerable medical men over long ages, which has brought in a verdict favourable on the whole to the use of alcohol in disease . . . it is well to bear

in mind that empirical results are deserving of consideration in the interests of our patients." This is of course true, but there has arisen during the past fifty years a strong and increasing body of experience based on a departure from traditional routine, with a consequent and steady increase in the disuse of alcohol. This experience and the results on which it is based are at least equally deserving in the interests of our patients, especially in view of the immediate context, where Sir Humphry says, "from the bulk of physiological investigations on the action of alcohol, it appears that alcohol is a depressant rather than a stimulant, and that its effects are more likely to be injurious than beneficial." Again, "it is hardly necessary to insist that the indications for its use should be scrutinized as rigorously as those of any other substance in the pharmacopœia."

A careful analysis and summary of the findings may be stated thus:

Alcohol is a depressant rather than a stimulant. It may by reflex irritation lead to stimulation of the heart, but tends to cause after-depression, to produce degeneration of cardiac muscle and impair resistance to disease.

Alcohol is a food-stuff, but while circulating and being oxidized in the blood, it can also produce toxic degeneration of the tissue-cells. As a tonic it may help a 'tired-stomach,' but may grip the patient and awaken hereditary possibilities.

Alcohol may be useful in sudden heart failure, but it is not so valuable as ether, and if continued in use may lead to serious myocardial (heart-muscle) failure.

Alcohol may lower blood pressure, but if used permanent degenerative changes may be induced at the same time.

Alcohol may be used as a narcotic, but other and more reliable hypnotics are available.

Another comprehensive and authoritative statement is contained in the chapter, 'Alcohol as a Medicine,' in the

government publication, *Alcohol; Its Action on the Human Organism.*

Recognizing a legitimate place for alcohol in treatment, it points out that any effect is due to the alleviation of symptoms, since "it may be said that alcohol does not act as a specific cure for any disease." The effect of "quinine on malaria or of emetine on amœbic dysentery is due to the destruction of the infecting micro-organisms, alcohol has no action of this kind." After discussing some of the actions of alcohol, the authors say: "We may summarize the known therapeutic actions of alcohol as follows: (*a*) its main value is due to its narcotic action, by which it allays excitement and distress, and induces rest and comfort, and thereby often ameliorates symptoms indirectly; (*b*) its limited food value may become important in association with its narcotic action, under conditions in which ordinary nourishment cannot be taken; (*c*) by diverting blood from the internal organs to the surface, it has an adjuvant action to the application of external warmth in warding off or abating the effects of the common catarrhal infection known as a 'chill.'" The authors then proceed to state some of the actions which are attributed to alcohol with no adequate reason. A 'popular illusion' is that which credits alcohol with a specific stimulant action on assimilation, so that its regular use is supposed to impart a physical robustness unattainable without it. The old idea that alcohol can build up the constitution dies hard, and although "this view is no longer widely held by medical men it appears still to be current as an article of popular belief."

There is also "the popular belief in alcohol based on the illusion that it has an important stimulant action on the heart, on the respiration and on the vital activities in general. Rational medicine has long abandoned this belief, but it still lingers in popular practice."

We insert these summaries, not because we necessarily agree with them nor because they would command universal assent, but because the whole question must be frankly and fully faced. Personally we believe that for all the conditions mentioned other medicines or substances, less harmful, less dangerous, and more constant and effective, can be used.

Whatever may be said about the occasional use of alcohol by a careful physician, there is no defence for its routine use, and so great is the danger, from every point of view, that it would be a safe rule of domestic life never to give alcohol to a patient except under definite and specific medical advice. The popular resort to alcohol in cases of fainting, etc., is unnecessary and dangerous. Unnecessary, because simpler and safer means, such as the use of smelling salts, a burnt feather held under the nose, or if the patient can swallow, sips of water would do equally well. It is dangerous because the direct effect of the alcohol might have serious results if the fainting were due to bleeding or certain serious internal conditions. Even sal volatile would be bad under such conditions.

A third and striking manifestation of the changed opinion was given at the Edinburgh meeting of the British Medical Association, July, 1927. Professor John Hay, Professor of Medicine at Liverpool University, opened a discussion on pneumonia. He dealt with his experience in a large union infirmary some years ago, when he divided pneumonia patients into two sections. In one no alcohol was used, there were 47 patients, 14 died, a mortality of 29.5 per cent. In another where alcohol was used there were 103 patients, 47 died, a mortality of 45.5 per cent. The average age in each group was 35 years. Deleting the cases which were moribund on admission, section one had 42 cases, 9 deaths, mortality 21.4 per cent., average age 34

years; section two had 87 cases, 31 deaths, mortality 36.8 per cent., average age 32.8 years. "I do not wish," said Professor Hay, "to stress unduly the actual figures, but I consider that the administration or withholding of alcohol was at any rate the dominant factor. . . . Experience has convinced me that alcohol is only of use to penumonia patients under certain well-defined conditions. It may be of service in procuring rest and sleep, it may be comforting, it may be given during convalescence, but to give alcohol in the belief that it is a cardiac tonic or stimulant is opposed to scientific teaching and clinical experience. It is not only futile, but detrimental, when administered in repeated doses to help a failing heart." Subsequent speakers spoke for or against alcohol, but undoubtedly the 'feeling' of the meeting was against rather than for the use of alcohol.

A fourth line of evidence emerged from an investigation into the use of alcohol in hospitals throughout the world, concerning their use of alcohol in 1900 and 1923. Six hundred returns were made from all parts of the world; one group, strictly comparable, consisting of 276 hospitals of all kinds in the British Commonwealth, gave the following results:

Year.	*Number of Patients.*	*Cost of Milk*	*Cost of Wines and Spirits.*	*Estimated Ounces.*	*Cost per Patient.*	*Ounces per Patient.*	*Cost per Occupied Bed*
		£	£		*Pence*		*Shillings*
1900	383,182	142,805	15,993	2,645,204	10	6.8	13.1
1923	670,841	376,202	23,103	916,380	8.2	1.3	9.0

(*N. B.*—In 1923 the average cost of alcohol had increased 4¾ times compared with 1900.)

These figures were published in *Alcohol in Medical Prac-*

tice, H. K. Lewis & Co., in 1924, and since then there has been a still further drop, almost universally, in hospital use of alcohol.

Alcohol in Fever Hospitals

In 43 special fever hospitals in Great Britain:

In 1900. 33,180 patients cost £1787 for wines and spirits, average of 1s. 0½d. per patient and 6s. 8d. per bed occupied.

In 1923. 48,330 patients cost £3249 for wines and spirits, average of 1s. 4d. per patient and 6s. 10d. per bed occupied; these figures, had there been no change in medical practice, would have been 4s. 6d. and £1. 10s. 0d.

Individual hospitals varied from 6s. 9d. per patient to *nil,* and from 33s. per bed to *nil.* The medical superintendent in whose hospital the largest amount of alcohol was used, wrote, "Alcohol is rarely necessary" (!).

Dr. J. D. Rolleston's figures for the Western Fever Hospital are striking. He said: "During the first two years after qualification I made free use of alcohol in the treatment of fevers, especially in diphtheria. During the last twenty-five years I have entirely abandoned the therapeutic use of alcohol."

In 1925, at the Western Fever Hospital, 2589 ounces of brandy were used, and the death rate from diphtheria was 8.54 per cent. In 1926, 914½ ounces had been used before Rolleston's appointment, during the remaining nine months 77 ounces were used, the death rate from diphtheria being 4.42 per cent. In 1927, 25½ ounces were used, the death rate being 3.01 per cent. (In 1928 only one ounce used.)

During the year no alcohol was used in diphtheria cases. The ambulance service conveyed over 12,000 cases of in-

fectious disease over a mileage of 68,000 miles and the nurses used only 15 teaspoonfuls of brandy.

Horsley and Sturge published certain hospital figures, and by the courtesy of authorities we are enabled to bring them up-to-date.

(*a*) Metropolitan Asylums Board

In 1894 the cost of liquor for 19,937 patients was £1388, in 1914 for 38,859 patients it was £300.

During 1927 the average number of patients under treatment each day was 6671. The total amount expended during the year for alcoholic liquor was £1639 7s. 0d. in infectious hospitals, and £140 in institutions for tuberculosis. So that, on the average, £4 17s. 6d. per day was available for 6671 patients.

(*b*) London County Mental Hospitals

	1889.	1905–1906.	1926–1927.
No. of Hospitals -	4	9	10
Patients—boarded -	7,246	17,024	19,666
Staff—boarded - -	861	2,433	2,459
Total daily average -	8,107	10,457	22,125
	(*Pints*)	(*Pints*)	(*Pints*)
Spirits used - -	8,529	1,741	300½
Wine used - -	6,687	265	59½
	(*Gallons*)	(*Gallons*)	(*Gallons*)
Beer used - - -	255,486½	1,281½	175

A reduction in the use of wines and spirits from 37½ ounces or 300 teaspoonfuls to less than 3 per person boarded.

(*c*) Seven Great London Hospitals

(St. Bartholomew's, Guy's, Middlesex, St. George's, St. Mary's, University College, Westminster)

Year.	*Beds occupied by Patients.*	*Cost of Alcoholic Liquors.*	*Cost of Milk.*
		£	£
1862	2,254	7,712	3,026
1912	2,462	1,238	11,874
1927	2,725	2,594*	21,843

* *N.B.*—Alcohol 4¾ times as costly as in 1912.

Finally, as an indication of the growing disuse of alcohol, these figures, based on official returns, are valuable and instructive.

LIVERPOOL HOSPITALS AND INFIRMARIES

(COMPILED BY MISS NELLY SMITH)

1923.				1926.		
	Expenditure.		*Name of Institution.*	*Expenditure.*		
Patients.	*Total*	*Per Patient.*		*Per Patient.*	*Total*	*Patients.*
	£ s. d.	*Pence.*		*Pence.*	£ s. d.	
4,780	170 0 0	8.5	Royal Infirmary	4.2	101 10 9	5,799
2,472	79 4 0	7.6	Royal Southern	6.6	82 19 0	3,003
3,489	105 9 6	7.2	Northern	6.5	107 12 6	3,969
1,460	2 1 8	.4	Stanley	.7	5 10 0	1,732
6,441	278 0 5	10.3	Walton (Poor Law)	.7	24 18 4	8,410
3,500	419 4 7	28.7	Alder Hey (Poor Law)	3.0	34 4 6	2,669
3,187	537 0 0	40.4	Smithdown Road (Poor Law)	20.7	252 9 3	2,918

In a statement issued by the Liverpool Alcohol and Civic Week Committee it is pointed out that:

In 1900, in the four General Hospitals (above) 8439 patients were given on the average 6.7 ozs. each. In 1926, 14,503 patients were given on the average .8 oz. each (or 54 teaspoonfuls reduced to 6). Had this change in medical practice not taken place, in 1926 the cost of alcohol would have been £2677 instead of the actual £297 12s. od., a saving of £2379.

Drug Addiction

In the last edition (Horsley and Sturge), it was stated that "prohibition of alcohol in the U. S. A. had resulted in a lessened amount of drug addiction." This has been controverted, and all sorts of wild statements have been made in the pro-liquor and anti-prohibition press. Through the kindness of Dr. H. S. Cumming, Surgeon-General, Public Health Service, Washington (June 18th, 1928), we are able to present the latest official facts and some figures. All the quotations are from the letter and documents sent by Dr. Cumming.

The Chief of the Narcotic Division, before Congress Sub-Committee, stated, "that three surveys in recent years set the figures at 100,000 drug addicts in the United States, but I am convinced that there are not that many. The propagandists that tell us how terrible this menace is, of course, estimate the number at from 500,000 to 4,000,000. We arrived at our figures through our agents in charge. We have 15 divisions, an agent in charge with from 15-25 men in the field. Our men get in touch with the underworld and elbow with the real addicts and pedlers, so that in many cities they know exactly how many they are, and they also question the health officers, the physicians, and the police departments; so that I think we have

perhaps the most accurate estimate of any available."

Taking the estimate of 100,000, it is further estimated that the minimum requirements of a morphine addict averages eight grains a day; so that about 420,000 ounces of morphine would be required annually. If cocaine is used, it is used chiefly with morphine. Opium is used by relatively few, and by them it is smoked. In New York and the N. E. section of U. S. A. a good deal of heroin is used (a form of morphia). Very little morphine hydrochloride or heroin is manufactured in the States, but most of the morphia found in illicit hands is the hydrochloride.

The present system of control of the domestic manufacture of narcotic drugs and their distribution for medical purposes is such as to prevent any readily discernible diversion to illicit use. In 1918, 22 per cent of the persons convicted for violation of the Harrison Narcotic Drug Act were registered thereunder; in 1920, 15 per cent. were so registered; and in 1927 only a slight fraction over 4 per cent. were registered. Of the 180 registered persons convicted in 1927, the total quantity of narcotic diverted by them was insignificant in comparison with the quantity smuggled. (By 'registered,' means officially licensed to sell or dispense the drugs.)

Practically all narcotic drugs used illicitly are smuggled into the States. Last year (1927) 4458 persons were convicted of violation of the Harrison Act, being 97.3 per cent. of all proceeded against.

At least 85 per cent. of all smuggled drugs (except opium for smoking) is brought in, at, or near the port of New York, where there is a well-organized business for smuggling and distributing the drugs to sub-agents in the cities. The amount of money in the business is evident. The price paid for illicit morphine varies from 11 or 12 dollars per ounce in New York to 35 to 50 dollars in De-

troit or Chicago. *The price paid by the addicts is about* 1 *dollar per grain or* 437 *dollars per ounce!* The recent surveys disclose comparatively few new addicts, and the average age of all addicts now apprehended is much higher than a few years ago. The charge that school children are using narcotic drugs has been thoroughly investigated and found to be utterly without foundation in fact.

Most of the drug addicts are said to be mentally deficient, or psychopathic characters. It will be fruitless, says the report, to proceed further with the curing of addicts of their habits unless the source of supply is eliminated. As long as the addicts are permitted to remain at liberty on the streets of our cities where they have access to the drugs they will continue to create a demand for smuggled narcotics. The solution of the whole problem seems to lie along the lines of isolation and segregation of addicts for institutional treatment, and fuller facilities for enforcement of the Act and the prevention of successful smuggling. It is worthy of note that in 1922, out of 71,676 first admissions to mental hospitals, there were 615 due to 'drugs and other exogenous toxins,' of these 181 are stated to have been of intemperate habits, 29.4 per cent. being the highest incidence of 'intemperance' among the psychoses, next to alcohol. Drugs and drink hunt together.

Methylated Spirits

A good deal is written in some sections of the press about methylated spirit drinking, and 'many hundreds of deaths' are alleged to have been due, especially in U. S. A., to 'wood-alcohol,' methanol, or methylated spirits. The latest facts seem to be as follows:

Drs. G. H. Bigelow, H. C. Lythgoe and Reid Hunt, Commissioner of Public Health, Director of Food Division

and Consultant in Pharmacology respectively, in the Department of Public Health, Massachusetts, have recently published some important work on deaths from alcoholism.

In 1925 (latest year for which mortality statistics are available in this country) there was an estimated population in the registration area of the United States of America of 103,108,000. In this registration area there were 182 deaths (180 in 1924) from 'wood,' methanol, or denatured alcohol, a figure equivalent to 0.18 per 100,000 population as compared with 0.14 in 1923.

In England and Wales, there have been during the past few years two or three deaths from methylated spirits. The convictions for drunkenness, said to be due to methylated spirit drinking, were 683 in 1932, 693 in 1924, 444 in 1925, 389 in 1926, and 428 last year (1927).

Turning to America, in 1927 there were submitted to analysis 8815 samples of intoxicating liquor. Eight of these contained methanol, wood alcohol, in quantities 1.1 to 2.2 per cent. in samples containing 24 to 30 per cent. alcohol and 2.8 to 6 per cent. in samples containing more than 30 per cent. alcohol.

Many samples of spirits said to have caused death were examined, but in all but one no other toxic substance than ethylic alcohol was found, and in that one case it was 23 per cent. methanol.

The authors impress the point that much of the whisky finding its way to consumers contains a greater percentage of ethylic alcohol than usual, with the result that if people drink their 'usual amount' and do not realize it is a stronger alcoholic proportion, serious results may accrue.

They refer to the fact that when distilled spirits are permitted to age in charred oak barrels, there is an increase of secondary bodies slightly more toxic than ethylic alcohol (*Journal of American Chemical Society*, 1908, page 68).

During the ageing process small percentages of fusel oil, aldehydes, furfural, acids and esters are formed. An aged whisky contains about 99.4 per cent. of alcohol and water and the other 0.6 per cent. consists of solids and these other products.

The authors find no evidence of any increase in toxic ambylopia (an eye disease), which is one of the most frequent sequels of the consumption of methyl alcohol. They point out that ethylic alcohol has a more toxic action on the higher nervous system than methyl alcohol, which is, however, more toxic to the body generally if taken in repeated doses.

Among the cases of death attributed to 'poison whisky,' in one case it was found that the liquor contained 80 per cent. ethyl alcohol, and in two other cases 60 per cent. of ethylic alcohol, and no other poison was found. When genuine 'bottled-in-bond whisky' of the most approved 'medicinal quality' was examined, it was found to be slightly more toxic than any of the samples of illicit whisky, plainly due to the fact that it had a higher content of ethylic alcohol.

Medicated Wines

In the last edition, Dr. Hutchison is quoted, (*Diet and Dietetics*), where he says: "The use of such liquors by an invalid on his own responsibility or even by prescription exposes him to the great danger of becoming by degrees the unconscious victim of alcoholism, and in the case of the coca wines, of the cocaine habit as well. On every ground their manufacture and sale should be strongly deprecated by the medical profession." Since those words were written, Dr. Hutchison has apparently altered his opinion, and in *The Action of Alcohol on Man,* page 180, says: "There are also several 'medicinal' (we presume he refers

to the so-called medicated wines) wines on the market in which the toxic effect of alcohol is increased by the addition of bitters, meat extracts, malt, etc., and there can be no doubt that when administered under medical supervision these have a legitimate place in treatment." [The origin and history of *The Action of Alcohol on Man* was fully exposed soon after its publication.]

CHAPTER II

THE EFFECTS OF ALCOHOL UPON THE NERVOUS SYSTEM

I. General

Since the issue of the first edition of *Alcohol and the Human Body,* there has been a most remarkable and growing convergent testimony as to the soundness and foresight of the statements then made, which earned for it such international reputation and led Stephen Paget to call it 'this classic.' To-day there is, generally speaking, a remarkable degree of unanimity of opinion that, "The direct effect of alcohol upon the nervous system is in all stages and upon all parts of the system to depress or suspend its functions, that it is in short from first to last a narcotic drug" (*Alcohol; Its Action on the Human Organism,* p. 41).

In *The Action of Alcohol on Man,* the late Professor Starling, after describing the pleasure to be derived from a glass of beer or the first glass of champagne, said, "All these results may be ascribed to the paralyzing effect of alcohol on the higher centres of the brain, the first stage of its action as a narcotic." Professor W. E. Dixon, in his textbook on *Pharmacology,* says: "It has been shown that attention, judgment, and the higher intellectual processes are retarded at once by amounts of alcohol insufficient to intoxicate." Sir James Crichton Browne, in *What we owe to Alcohol,* published by the True Temperance Association,

tells us among other things in favour of alcohol "that it blurs the moral twinges."

True, and let it be remembered that it is through the higher levels of the brain that man is able to rise to the appreciation of moral truths, to aspire to higher things, and to exercise that 'awful compulsion to think,' which men call conscience. Through them, too, man becomes conscious of the doubts and difficulties and annoyances of life, and supremely of those 'moral twinges' which, if heeded, may keep him on the gallant road.

Here are four testimonies, and they might be multiplied from current scientific literature, and they all converge upon one final verdict:

"That without signs of intoxication in the full ordinary or legal sense of the term," a man under the influence of even small doses of alcoholic liquor becomes "an altered individual," and always altered for the worse rather than the better.

It was this fact which led Sir Charles Sherrington, President of the Royal Society, to say at Hull (National Temperance League meeting):

"Alcohol has a drugging effect, and so it begins to tamper with the running of the machinery, or 'to monkey the machine,' as in America it would be most fittingly termed. The machinery it 'monkeys' is of the most precious kind. The kind of experimenting I do is such that it is no good taking short spells at it, and so it involves practically the whole of a long and very arduous day, with the result, therefore, that at about five o'clock in the afternoon one feels very tired. Well—what should I do to get over the difficulty? Take alcohol? No, most certainly not, for I know that would mean disaster; and that decidedly is my own feeling about it.'

This is what one of the leading experimental physiologists says.

Sir Maurice Craig, the great mental and brain specialist, speaking at a Mansion House meeting for business men, said:

"The pressure of business life under modern conditions is very great; no time for mid-day meal, no time for rest, and, unfortunately, there is nothing which in certain persons is so rapid in removing a sense of fatigue or feeling of depression as alcohol. It acts by desensitizing the nervous system and in consequence removes the disagreeable sensations; and herein lies the danger, as most men estimate the value of a thing by its immediate and manifest benefits, and seldom stop to weigh any ultimate and may be permanent disadvantage. I am always seeing splendid fellows who have either crippled themselves or their future prospects by thoughtlessly indulging in alcohol in early life, or have turned to it to flog a fatigued nervous system into further action, with the sequel that they ought to have foreseen. Watch your sleep, as this is the only thing that repairs fatigued tissue, but never rely upon alcohol to get sleep. It is the worst form of sedative, for the dose requires to be constantly increased" (*Nat. Temp. Quarterly,* No. 21, 1928).

It is such language and such calm and reasonable judgments that help us to realize what great disservice Lord Dawson of Penn did to the cause of accurate scientific knowledge, as well as to his fellow peers and fellow countrymen, when he spoke as he did (about the term narcotic as applied to alcoholic beverages) in the House of Lords (see *Parliamentary Debates, House of Lords,* vol. 57, No. 49).

Experiment shows, with a consistency and thoroughness which cannot be gainsaid, that alcohol, even in the smallest doses, deadens or blunts the higher activity of the brain,

weakening inhibition, leading to neuro-muscular incoordination and diminished efficiency; whilst in larger doses it induces definite paralysis.

Yet experience, which has a certain validity of its own, says, 'We feel better, freer for its use,' and through long ages man has found a solace in alcohol which he will not readily renounce, consequently its hold on tradition and custom has made it seemingly a necessary part of convivial life and social intercourse.

Why? Is the experimental work at fault? Is the experience untrue? No, both are true; and herein lies at once the charm and allurement of alcohol, no less than its terribly insidious danger.

Through the higher levels of the brain man becomes conscious not only of the joys and glories and aspirations of life, not only of his contact and communion with a fuller and richer life around and above him, but of the tensions and conflicts, doubts and difficulties, and perhaps, above all, of the petty annoyances of life and its discomforts which for many make so large a part of life's disharmony. Now, alcohol never adds to the deeepst joys of life; it never in this world deepened the wondrous joy of motherhood, nor enhanced the glory of fatherhood, never hallowed a deep sorrow nor consecrated a great passion, never really made man or woman yearn and aspire towards a great ideal. But it has deadened the poignancy of grief, it has softened some harshnesses of life, it has appeared to heighten the joy of social intercourse. It has drowned sorrow, and not infrequently also submerged the sorrower. It has degraded womanhood and dethroned manhood, even as it has given a passing sensuous enjoyment to its votaries.

Let us frankly face it; alcohol can under certain circumstances, for those who like it, produce a careless sense of well-being—euphoria—but it can also produce anæsthesia.

Indeed, these are twin children of alcoholic inebriation in its lower and early stages.

Let us look at it along certain representative lines of thought. Here is a tired, anxious, overworked, worried man, sore beset by the conditions of his life, torn in the conflict between character and circumstance, bound in the meshes of modern competitive life.

Here is an equally overworked and tired woman, with the care and burden of a family, with perhaps the endless task of making 'two ends meet' to the accompaniment of a chronic backache.

There is a very prosaic figure—just a chronic dyspeptic.

Here is a girl skimming on the surface of society, bored at heart with its emptiness and essential unreality, and here a lad who wants to 'see life' and yet feels in his innermost heart that it bears the mark of death.

And there is a group of ordinary everyday men and women who dislike the restraint which gives dignity to social intercourse. Well, they all possess one thing in common, a cortex, the final product of evolution, with its higher level of brain cells and fibres, through which they each become conscious of the discord, the weariness of routine, the worry, the backache—a cortex through which they become conscious at times of greater and better things, conscious of those 'moral twinges' which alcohol can so easily blur.

Alcohol numbs the cortex, dethrones, be it ever so slightly, the crown of evolutionary progress, dulls the pain, stills the conflict—but the cause remains. While the alcohol is at work the unfortunate sufferer is possessed by the euphoria which he calls 'stimulation.' The 'stimulation' is but the temporary and dearly bought relief from the consciousness of disharmony, it is but the other side of the paralysis of the higher. It is, in a sentence, simply the re-

sult of a deadening of the power of appreciation; it has secured a flight from reality into the illusion of narcosis.

Alcohol does nothing, absolutely nothing, to remove the cause, although it deadens the power of appreciating the result. If its action be sought continuously or frequently, then deeper draughts are constantly called for, until at last, and indeed only too often, the euphoria ends in an anæsthesia to all that is highest and best.

All around us today are men and women in all classes of society faced with the same difficulties, conflicts and pains, and they are meeting them and surmounting them without recourse to either the euphoria or anæsthesia of alcoholic inebriation.

Alcohol is indeed never necessary, it is only the tyranny of custom which leads to the tyranny of habit, and only too often alcohol proves a harder taskmaster than the thing for which it was taken.

The worry of the business man is hushed simply because alcohol has blunted the fine edge of perception, and blunted it not only in one direction but in others. The pain of the backache passes temporarily because the sensitive nerves have been 'doped' and silenced for a time. The lad 'sees life' because he has blunted his vision and lost his ideal. The dinner party is free because so often dignity passes with the relaxation of restraint. The conviviality of the alcoholic dinner party is due to the removal of restraint and frequently issues in loss or degradation of propriety and dignity. Gibes are sometimes thrown at the dullness of a teetotal party or function. Well, it may be so; it may be that teetotallers feel the burden of England's greatest single evil, but no teetotal party or function has ever produced the scenes we have seen at the mess on guest night, at a college supper or a hospital dinner . .

As we write, we are mourning the loss of a great Scotch

physiologist, Dr. Noel Paton, who in one concise sentence has summed up the whole matter: "Alcohol increases the pleasure of life by paralyzing the critical faculty."

> "Thus men go wrong with ingenious skill,
> And bend the straight rod to their own crooked will,
> And with a clear and shining light supplied,
> First put it out, then take it for a guide."
> (*The Progress of Error*—COWPER.)

II. Effect of Alcohol on the Neuro-Muscular System

Muscular action may be voluntary or automatic, and in many of the complex activities of modern daily life there is a combination of both. I came into my room, picked up my pen, and began to write—three definite voluntary movements. Once I had made up my mind as to what I wished to write, my pen ran along, and although I deliberately thought of words and sentences, the formation of each individual letter was largely automatic, the result of education and practice. As I wrote, a bee came in at the open window and flew in my face; automatically I drew back and whisked it away. Many of our actions are of this automatic kind; the threat of an impending blow, the hearing of a sudden noise, will lead to an almost instantaneous 'blinking,' rapid closing of the eyes.

If a subject sits on the edge of a table, with his legs hanging loosely, and the front of the knee just below the knee-cap is tapped, almost immediately the leg will be extended, jerked forward. This is a reflex automatic action known as the knee jerk. Simple as it seems it depends upon quite a complicated mechanism of nerves and muscles acting through the mediation of the spinal cord. Thus there is the nerve ending in the skin, and the ligament or gristle which connects the knee-cap with the front of the

leg; here is the nerve which transmits an impulse from the tapped knee to the spinal cord; there is in the cord a 'receptor neurone' which receives the impulse. From the receptor, dendrites pass to a motor or 'effector-neurone' which effects the transmission of an impulse to the muscle, which contracts, and as a result causes an extension of the leg and the jerking forward of the foot. Time elapses from the moment at which the knee is tapped to the extension of the leg and the jerking of the foot. This time interval can, by certain electrical arrangements, be accurately measured.

The Effect of Alcohol on Automatic Actions has been most thoroughly investigated by Miles, and Dodge and Benedict. Miles' work is fully recorded in Nos. 266 (published 1919) and 333 (published 1924) by the Carnegie Institute, Washington, U. S. A. The investigations were mainly upon the knee jerk and the eye-closing or blinking reflex.

The former of these investigations is unique because the experiments were performed on the same subject by different observers.

The net results of the experiments is to show that under quite small doses of alcoholic beverages the length of time taken for the reflex was longer and the amplitude or degree of the movement decreased.

With the eye-closing reflex, they all found that the rapidity of action was impaired by alcohol. In the course of their experiments Dodge and Benedict found that two of their subjects had abnormally small eye-closing reflexes and the other four normal reflexes. On giving alcohol (30 c.c.) there was a decreased extent of eyelid movement in the four, but an increased movement in the two. On enquiry it was found that one of these was a boxer and the other a 'revolver-shot.' As a result of practice and training these two had acquired a power of inhibition, *i.e.*, of

control over their reflexes. Why did the eyelid movement increase under the influence of alcohol? Simply because alcohol lessened the power of inhibition, weakened the control and so increased movement took place. Alcohol abolished the educational advantage which by practice and training had been attained.

The Practical Bearing of These Experiments.—The true inwardness of these experiments lies not in the mere fact that knee jerks or eyelid reflexes were interfered with as such, but in the fact that reaction time was lengthened under the influence of alcohol. In much of our activity we combine voluntary and automatic actions. As a result of education and practice, for example, in motor driving, the action becomes almost automatic; a very little thought will show how easily even a small dose of alcohol may have a most serious effect.

Alcohol not only increases reaction time, but it tends to interfere with and impair the rapidity and keenness of perception, and gives the driver a fictitious and illusory sense of competence, and, moreover, makes him tend to take risks, to have an uncritical self-satisfaction with performance. Here we get at the very core of the menace of the intoxicated motorist, and by intoxicated, we do not mean 'drunk' or incapable in the legal or ordinary sense, but one who is for the time being under the influence of alcohol, however small the dose taken.

We can well understand why the great motor bus corporations are insistent upon total abstinence for both drivers and conductors when on duty. The prohibition of alcohol should be extended for at least three hours before coming on duty.

The Effect of Alcohol on Voluntary Actions.—Since the last edition, much valuable work confirmatory of the position reached by Kraepelin and others has been recorded.

We shall simply refer here to the main publications and not go into any great details, since they have appeared in many current journals, such as the *British Journal of Inebriety* and the *National Temperance Quarterly*.

(*a*) Vernon ('The Influence of Alcohol on Manual Work and Neuro-Muscular Control.' Special Report Series, No. 34 H.M. Stationery Office, 1919, price 2s. 'The Alcohol Problem': Bailliere, Tindall & Cox, 9s. net).

Vernon's work has become classical.

(*b*) Miles (*Journal of Experimental Psychology*, vol. iv, page 121, 1921).

Miles used a most ingenious instrument, called the 'pursuit meter.' Briefly, a stream of water was delivered irregularly by a mechanical device, and the test consisted in seeing how much of the water the subject of experiment could catch in a given time as the stream altered its position. The test required judgment, promptitude, and co-ordination of hand and eye. He used a small amount of alcohol, viz. a beer containing 2.75 per cent. alcohol. The result on average of a large number of tests was an increase in errors amounting to 11 per cent.

(*c*) Hollingworth (*Journal of Abnormal Psychology and Social Psychology*, vol. xviii, 1923).

A great variety of mental and muscular tests.

One new one, interesting partly on account of its novelty. A metal plate with a hole in it was exposed. The test was to insert a metal pointer accurately into the hole. The plate and pointer were connected with an electric bell and battery in such a way that if the pointer went in cleanly nothing happened, but if through unsteadiness it touched the side, then the electric circuit was completed and the tell-tale bell rang! He experimented with six men, and used varying amounts of alcoholic liquor containing 2.73

per cent. by weight of absolute alcohol. He says: "Small doses of alcohol produce marked loss of steadiness; this loss is unmistakable, and is found not only in average records but in the case of each subject. In all the mental and motor tests the effect of alcohol is to reduce the score."

(*d*) Diner (*Medical Record,* August, 1921) relates some experiments on medical students with simple arithmetic. He says: "Alcohol caused a quicker response at the expense of accuracy."

(*e*) The issues of the *International Review Against Alcohol,* for the past few years, contain a number of articles in French and German (brief English abstracts usually given), dealing with various physiological and psychological tests. They all prove the deleterious effect of small doses. H. W. Atkinson, M.B.E., M.A., has translated some of these, and also the main medical features of recent congresses in the *National Temperance Quarterly* for 1927-1928.

The upshot and convergent testimony of all this work is to emphasize and prove beyond a peradventure, that when brought to the test of strictly controlled experiment, alcohol even in small amounts and dilute form had a deleterious effect upon all forms of neuro-muscular action, whether voluntary or automatic. Professor McDougall's work was referred to in the last edition by Dr. Mary Sturge. Here we need only emphasize that, while his work showed an increase of error or loss of power under the influence of small doses of alcohol, the great value lay in the revelation of the effect of small doses of alcohol on critical judgment. Whilst errors were increasing under the influence of alcohol, the subjects had the pleasing subjective sensation that they were doing better than usual.

This subjective delusion has been observed by many other observers, and is of far greater significance than the increase of error.

The Effect of Alcohol upon the Emotions.—The human mind has three fundamental features or attributes: a normal individual can think, can strive after some object, and can experience certain feelings or emotions. He can 'think,' 'feel,' 'will.' Under normal conditions these are more or less completely balanced, and enter into every aspect of human behaviour more or less. If one of the characteristics is unduly noticeable or predominant it is remarked upon; thus we may say of a preacher that he is 'too emotional,' or of an individual, that he is possessed of great 'will' power.

One of the most common effects of alcoholic indulgence is to interfere with the normal balance, so that emotions, unrestrained by reason and judgment, tend to pass into irresponsible action.

It would carry us beyond the intended scope of these chapters to dwell at length on the present views held concerning human behaviour. Suffice it to say that an increasing number of psychologists to-day recognize that instinctive desires and appetites, with their accompanying tendency to pass into action, lie at the base of human behaviour.

In the course of evolution, primitive animal desires and instincts have become subordinated to intelligent judgment, discrimination, and control. This subordination has been made possible through the development of the cortex (or neopallium), which is the organ or instrument of man's higher mental life.

In the lower animals, behaviour is almost entirely instinctive, with a minimum of intelligent control, and the main instrument of such animal and instinctive behaviour lies in masses of grey matter at the base of the brain, known as the basal ganglia. These masses consist chiefly of the optic thalamus and corpus striatim.

In the development of the human brain these masses have passed under the control of the cortex, but still possess a certain autonomy of their own.

In human life every impression which may lead to sensation or feeling passes first to the optic thalamus and is then passed to the cortex for discriminating judgment and reasonable control.

Now, man's great prerogative is to rise from more or less blind animal instinctive action to reasonable control, to bring indeed every sensation and desire to the bar of judgment before allowing it to issue in action; to emerge from the animal to the human and then to aspire to those higher realms of life and conduct where he enters into communion and fellowship with the 'good,' the 'beautiful,' the 'true'—in a word, with God.

In all this upward movement, and indeed in all that makes for civilization, the cortex is man's supreme instrument. When the power or instrumentality of the cortex is impaired and reduced, then man is for the time dethroned. As Sir Henry Head said: "The reactions of the human optic thalamus, freed from the rstraining influence of the cortex, are an almost perfect expression of the non-discriminating aspects of sensation." The bearing of this, when once we realize that alcohol depresses and paralyzes cortical activity will be obvious. "The cortex is the organ through which thought and spirit raise man above the level of the brute. By discarding them we may lose the proper excellence of men, but cannot acquire the excellence of animals" (Bertrand Russell).

Evidences of the Effect of Alcohol on the Emotions.—(*a*) *Crime.* H.M. Judges have again and again drawn attention to the close connection between certain kinds of crime and alcoholic indulgence. One of the most apparent —we had written 'striking'—proofs is the way in which

common assaults rise and fall with alcoholic indulgence. Thus:

Scotland	1899.	1909.	1914.	1918.	1920.
Assaults by Husbands -	3891	2301	3161	769	2454
Millions of Proof Gallons of whisky consumed in the national life - - - -	8.38	5.92	6.47	2.98	4.49

(*Alliance Year Book.*)

ALCOHOL AND CRIME (ENGLAND AND WALES)

Nature of Crime, etc.	*Proportion of Annual Averages per 100,000 Population.*					
	1900-04.	1905-09.	1910-14.	1915-19.	1920-25.	1926.
Convictions for Drunkenness -	656.8	590.9	532.2	227.1	212.2	184.5
Assaults - -	184.9	141.6	118.4	83.1	93.5	81.6
Cruelty to Children - -	11.6	8.5	9.4	6.6	4.4	3.0
Crimes against Morals* - -	4.7	4.9	6.4	6.1	7.9	8.7
Crimes against Morals† - -	47.1	45.2	43.4	27.1	21.6	21.8
Consumption of Spirits: Galls. per head population - -	0.92	0.75	0.58	—	0.20	0.26

*Criminal Statistics, Table E, crimes known to police.

†Criminal Statistics, persons tried on indictment and summarily. (The second group against morals includes forms of crime not included in the first group and are kept distinct as in Criminal Statistics.)

Here the connection between drink and crime is fairly obvious. It is not claimed that 'drink' is the only cause. It must be remembered that crime in the widest sense is often a reflex of other conditions and of what may be termed the philosophy of the day. The increase in certain crimes against morals is, we believe, partly a reflex of much of the current teaching concerning morals and moral ideals. The way in which moral and sexual crime and licence is condoned and often glorified in many modern novels and elsewhere is bound to have a disastrous effect. Much of the scandal of to-day is intimately bound up with such teaching We are suffering from much perverted sex teaching, and however great may be the debt which some aspects of modern psychology owe to Professor Freud and his school, we believe that the application of so much pathological teaching to the explanation of normal life and behaviour has had, and will continue to have, a disastrous effect on moral ideals. The Freudian philosophy as revealed in some of Freud's latest books (in English), such as *The Ego and the Id,* is so essentially soulless and deterministic that it must colour all application of theory to practice.

Then too, alcohol, far short of the production of drunkenness or disease, is only too often the enemy of morality. It must be borne in mind that alcohol is an aphrodisiac, and because of its effect on sexual desire, and its power to blunt conscience, it is one of the chief buttresses and supports of prostitution in every part of the world. Alcohol probably does not cause prostitution, although it may lead to the first fall, but once prostitution is established 'drink' is its most powerful ally.

The intimate correlation between 'drink' and certain moral offences, including indecency, is graphically shown in the accompanying chart (Fig. 1), partly taken from and wholly based upon Scottish official statistics. In reading

this chart it must be remembered that Scottish criminal statistics are arranged differently to English, and therefore are not comparable with each other, although both are

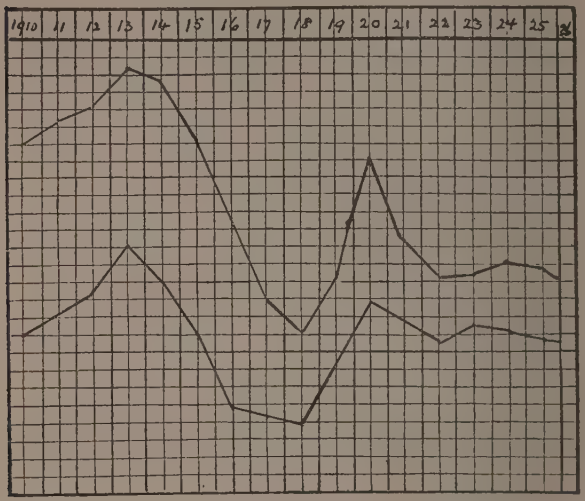

FIG. 1.—CRIME AND DRUNKENNESS (SCOTLAND)

The upper curve represents persons proceeded against for drunkenness and breach of the peace, 1910-1926, 92,443 in 1912, 41,407 in 1926.

Lower curve, convictions for crimes against morals, chiefly indecency, 900 in 1910, 870 in 1925.

Note how they rise and fall together.

illustrations of the correlation between alcoholic indulgence and crime. The upper curve runs from 1910 to 1926 and represents proceedings for drunkenness and breaches of the peace, 92,443 in 1912, 41,407 in 1926. The lower curve represents crimes, chiefly indecency and similar offences, rising from 900 in 1910 to 870 in 1925. The parallelism

is remarkable—note the peaks in 1913, then the falls to 1918, with a sharp rise again in each in 1920.

Turning for a moment to another aspect, we compare herewith certain county boroughs of England and Wales with regard to convictions for drunkenness and certain forms of crime.

In making such comparisons, we are conscious of the need for caution. Convictions for drunkenness are not necessarily true indices of the real amount of drinking in any given area, and convictions for drunkenness and other untoward conditions do not always run along parallel lines. But when large numbers do fall into series parallel and consistently in one direction there is at least strong presumptive evidence of definite relationship.

ALCOHOLISM AND CRIME IN COUNTY BOROUGHS, ENGLAND AND WALES

(Licensing Statistics 1927 and Criminal Statistics 1928, both referring to year 1926.)

	Population involved.	*Convictions per 10,000.*	*Crimes of Violence against Morals and Suicide.*	*Crimes against Morals only.*	*Crimes of Acquisitiveness.*
irst ten - -	3,640,514	37.2	3.2	1.3	56.0
econd ten - -	1,010,967	17.5	2.0	1.2	46.9
hird ten - -	6,098,821	13.2	2.3	.97	51.8
ourth ten - -	1,904,056	7.3	2.0	.87	39.9
ifth ten - -	1,131,649	5.6	1.7	.68	37.7
ixth ten - -	1,255,684	3.5	1.7	.86	30.5
Vhole of County Boroughs, England and Wales		17.0	1.8	.8	31.8

In the upper and lower groups are thirty county boroughs arranged in groups of ten according to their convictions for drunkenness per 10,000 population. At the

bottom are the corresponding figures for whole of England and Wales. Note how closely the figures for convictions, crimes, crimes against morals, and crimes of acquisitiveness run together. If it be argued that these figures simply denote degree of police activity, the fact remains that the results of such activity followed such a parallel course.

Crime in Sweden.—In the last edition (Horsley and Sturge) the influence of alcohol upon crime in Sweden was noted. Through the courtesy of the Swedish authorities, who sent me the most full and detailed statement based on their very carefully compiled national statistics, I am able to present these figures:

ALCOHOL AND CRIME IN SWEDEN*

Years.	*Prisoners (Men.)*	*Due to Drink. % of Crimes.*	*Prisoners (Women.)*	*Due to Drink. % of Crimes.*	*Consumption of Alcohol per head of population.†*
1887-97	24,398	71.2	2,766	13.4	4.9 (1886-90)
1898-07	28,267	71.6	2,559	18.0	
1908-17	29,848	59.0	2,084	21.9	
1918-26	27,086	35.7	1,734	20.5	2.9 (1923)

Alcohol and its Relation to Suicide.—That there is such a relation has been long recognized. The latest evidence is contained in the Decennial Supplement of the Registrar General, published in 1927. As we shall use his figures a good deal, we may add a word of explanation. This supplement deals with the deaths which occurred among males

* *Bureau de Statisque de Suede*, 1928.

† *International Year Book* (Hercod and Koller). Note how the relationship lessened with the decline in consumption, and note also the somewhat alarming increase in the female proportion.

during 1921, 1922, 1923. The age limit dealt with (mainly) is that from 20 to 65 years, and for purposes of calculation the census population of 1921 is used.

In order to grasp the value of the facts and figures revealed, it may be necessary to explain some of the main points concerning the nature of this document. In making comparisons the Registrar General deals first with 'occupied and retired civilian males between the ages of 20 and 65 years.' It is found that in the various age groups within this limit of years, a standard population of 109,296 males sustained 999.8 deaths (reckoned as 1000). Whilst 109,296 occupied and retired civilian males had 1000 deaths, a similar number of farmers would have had 674, whilst doctors would have had 1021, tin and copper miners, 4335. Among the Trade, brewers would have had 1346, cellarmen 1510, publicans 1585, and barmen 1955. These various figures are called Comparative Mortality Figures. There are 178 occupations dealt with in the supplement; some of them are by their very nature extremely hazardous to life, and the Registrar arranges them in order, from farm bailiffs with the lowest Comparative Mortality Figure (called C.M.F.) to tin and copper miners with the highest, and numbers them accordingly 1 to 178. In such a list brewers stand at 149, cellarmen 162, publicans 166, barmen 174, for deaths from all causes. In addition to this occupational grouping, the Registrar also classifies the occupied males into 5 Social Classes. The upper and upper middle and professions in Class I., then an intermediate Class II., then the skilled workmen Class III., then another intermediate Class IV., and finally, general and unskilled labourers in Class V.

Just as the C.M.F. is worked out for individual occupations and causes of death, so it is worked out for these various social classes, with the result: taking all occupied and

retired civilian males 20-65 years as 1000, then the C.M.F. for the Classes I. to V. is 812, 942, 951, 1007, 1258.

Finally (by way of explanation), just as individual occupations and social classes have their C.M.F. worked out, so the individual causes of death for occupations and classes are given.

Thus: Occupied and retired civilian males have a C.M.F. represented by 1000, and their C.M.F. for tuberculosis is 177.3, for cancer 128, cirrhosis of the liver 9.6, and so on.

Class I. has a C.M.F. represented by 812, whilst for tuberculosis it is 90.1, for cancer 102.5, for cirrhosis of the liver 15.6.

In using the supplement, note that the method of calculation differs from that used previously (*i.e.*, 1901-3), hence comparisons must be made very carefully.

Returning to the question of suicide.

The supplement states: "In its general form, *i.e.*, class incidence, the social distribution of mortality from suicide resembles that from cirrhosis of the liver. In both cases mortality is in excess only for Classes I. and II. (the upper, upper middle and professional classes). It is not necessary to infer from this similarity that alcohol is the chief cause of suicide, but a considerable association between these two causes of death is indicated by the correlation coefficient of $+.375 \pm .045$."

The C.M.F. works out as follows:

	Cirrhosis of Liver.	*Suicide.*
All occupied and retired civilian males 20-65 -	9.6	24.3
Classes I. and II. -	16.7	29.5
Class III - -	6.3	22.0
Classes IV. and V.	7.7	22.6

If we take ten occupational groups, irrespective of social class, with the highest cirrhosis of the liver mortality their suicide mortality is 39.1. The ten groups with the lowest cirrhosis of the liver mortality average a suicide mortality of 21.3, the average for all the groups (178) being 24.3 for suicide. As in so many other directions, the Trade pays a terrible price for its complicity in the liquor business. Thus, taking the standard as 1000 for all causes, brewers are 1346, cellarmen 1510, publicans 1585, barmen 1955; whilst for cirrhosis of the liver the figures are: brewers 8000, cellarmen 4698, publicans 11,552, barmen 5833; and for suicide, brewers 2650, cellarmen 1621, publicans 2609, barmen 1654.

Put in another form, arranging all groups from 1 to 178, then for all causes of death, brewers are 149, cellarmen 162, barmen 174, publicans 166; for suicide, brewers are 175, cellarmen 162, barmen 163, publicans 174.

It is interesting and full of suggestive thought, that in 1927 in Greater London out of 89,383 deaths from all causes, 1.1 per cent. were due to suicide. In the individual boroughs the highest percentages of all deaths due to suicide were, Chelsea 2.2 per cent., Holborn 2, Hampstead 1.9, Westminster 1.7, Stoke Newington 1.7, and Kensington 1.4; whilst the lowest were, Finsbury .4, Stepney .6, Poplar .6, Hammersmith .6, Bermondsey .8, and Deptford .8.

The connection between suicide and alcoholism and its concomitant conditions has been shown graphically by Dr. Ruth S. Cavan in her book, *Suicide* (Chicago University Press, $3.00). Before mentioning her figures, abstracted from *The Scientific Temperance Journal* of America, it may be well to get the general American and English background.

The suicide rate for U. S. A. has fallen steadily from 16.7 per 100,000 population in 1915 to 12.1 in 1925 (latest

available figures in 1928). In the cities of the registration area it fell from 19.7 to 14.7 (1924), and in Chicago from 24.8 to 15.3. The crude annual death rates from suicide in England and Wales have been and still are lower than the American, but there is a somewhat ominous rise in recent years. The death rate per 100,000 each year since 1916, has been 7.3, 6.4, 7.5, 8.8, 9.0, 9.9, 10.0, 9.6, 10.5, 11.4 in 1926, 12.5 in 1927. Dr. Cavan investigated certain areas and conditions in Chicago, and found a very high suicide rate in certain districts; they were divided into four sections. She says: "Symptoms of social disorganization had its counterpart in personal disorganization, among the prominent features being divorces, pawn-shops, lodging-house life, and alcoholism. The high rate of divorce in these areas is all the more remarkable because of the dearth of family life: where there has been no marriage there can be no divorce."

The picture she draws of these black spots in Chicago is somewhat terrible. There are four:

Lower North Side with a suicide rate of 35 and alcoholism rate of 12.5 per 100,000.
West Madison Street with a suicide rate of 40 and alcoholism rate of 47.8 per 100,000.
Near South Side with a suicide rate of 59 and alcoholism rate of 28.7 per 100,000.
The Loop with a suicide rate of 87 and alcoholism rate of 52.2 per 100,000.

A vivid picture of drink, depression, degradation, and death.

A similar piece of evidence was presented by Dr. Hindhede of Copenhagen to the British Medical Association in 1922, since brought up to 1924 in a private communication, July, 1928.

In 1900 to 1909 Denmark was consuming 7.8 litres of absolute alcohol per head and the death rate per 100,000 (males 25 to 65 years) was for alcoholism 76 and suicide

98. During the War extreme rationing of food and alcohol was enforced, so that in 1918 the consumption of alcohol was 1.5 litres per head, the death rate per 100,000 for alcoholism being 1 and that for suicide 28. By 1924 the alcohol consumption was nearly doubled, being 2.9 per head; death rates being, alcoholism 4, suicide 56.

One other illustration of the relation between alcoholism and suicide is borne out by certain American figures, compiled from strictly official sources. The registration States as a whole had in 1916 a death rate from cirrhosis of the liver of 11.8 per 100,000 and from suicide 13.8 per 100,000.

Those States which had a higher than average death rate from cirrhosis of the liver, had for it 13.4 per 100,000 and for suicide 16.5.

Those which had a lower than average for cirrhosis had a death rate of 8.0 per 100,000 and for suicide 11.6.

In 1925 the average for all States was, cirrhosis 7.3 and suicide 12.5, whilst those with a higher average had cirrhosis 8,5 and suicide 13.5, those with a lower average had cirrhosis 6.0 and suicide 11.2. Finally, it is possible to arrange certain States in the order in which they had restrictive liquor laws prior to 1915. They varied from State-wide prohibition to State-wide full licence. Here are their figures for 1916 and 1925 (in brackets).

DEATH RATES PER 100,000 POPULATION IN CERTAIN STATES

	Alcoholism.	*Cirrhosis of Liver.*	*Suicide.*
Prohibition States -	2.8 (1.6)	7.3 (4.8)	9.1 (8.0)
Near Prohibition - -	3.8 (2.7)	8.0 (5.4)	11.4 (10.5)
Half Licence - -	5.4 (3.6)	10.9 (7.6)	15.9 (11.1)
Full Licence - -	9.2 (5.5)	13.4 (8.8)	15.8 (12.6)

Let us repeat—we do not claim more than this—that these figures bear out the general impression of international experience that there is a close, progressive, and parallel association between alcoholism, cirrhosis of the liver, and suicide.

Alcohol and Cruelty to Children.—Closely allied to the emotional state of savagery and depression, as evidenced by violent and 'moral' crime and suicide, is that of callousness to the ordinary social duties and to the human obligations of life. The cries of children make no impression on a brain dazed with alcohol, finer parental feelings are blunted, and the normal parental emotions of affection and desire to protect the child are smothered.

We have already seen that convictions for cruelty to children fell with the decreased consumption of alcohol (see page 28). Here, as in other directions, the shadow thrown by 'drink' is not so intensely black as it was in years that are past, the decrease in the national consumption of alcohol, the better housing, the extension of welfare work and other social factors have all had their effect in bettering the life of children. Since its formation in 1884 until March, 1928, the National Society for the Prevention of Cruelty to Children has dealt with 1,365,168 cases involving 3,743,328 children. During 1927-28, 39,774 cases involved 98,158 children. In 1908 the Director said, "it was no exaggeration to say that 90 per cent. of the cases were mainly due to drink." In 1928, the Report states that after very special care by, and directions to, the Inspectors, it was found that 4,490 or 11 per cent., of the cases were due to drink.

In the early years of its work 45.7 per cent. of the cases were cases of violence and 5.5 per cent. corruption of morals. In 1927-28 there were 7.8 per cent. cases of violence and 0.8 per cent. cases of corruption of morals.

The Secretary for the Royal Scottish Society writes (May 23rd, 1928): "In 1927 we had in all 7,235 cases, affecting 21,156 children. The last matter you refer to in your letter interests me greatly, viz. the number of cases brought before us due to drinking or the immoderate use of intoxicants, interesting because this subject has been brought up repeatedly during the past 6 months. It is a very difficult thing to give anything approaching the exact figures in percentages, as so much has to be taken into account. For instance, we may have a complaint made to us of child neglect which is due to a father and mother quarreling, and drinking may be at the bottom of the quarrel, but we cannot put this as the ground of the complaint. Before the War the drinking conditions were much worse than they are to-day, and the highest figure I could ever put upon any of the districts where drinking was very bad was 70 per cent. of all our cases being due to immoderate use of intoxicants, directly or indirectly; and in these same districts that figure has fallen to-day to less than half, about 30 per cent. All over, the conditions in Scotland are greatly improved in this important matter; and while some say it is due to the decreased facilities and increased cost of liquor, I have reason to believe that a greater wave of temperance has come over the land."

It may be said, and it is a terrible condemnation of national life, that whatever improvement there may be, there are still over 100,000 child sufferers from various forms of cruelty. True; but let it be noted, in 1890 there were only 52 centres of work, with 29 inspectors, and an income of £8,835. To-day there are 2,243 centres of work, 250 inspectors, and an income of £134,233. It is hardly an exaggeration to claim that, if there had not been a higher level of life, the total number of cases would have been much greater. How far the reports of inspectors are able

to reveal the 'drink' factor is a point for debate, but it is at least satisfactory to note the decrease in violence and in the corruption of morals, and a widespread impression that less 'drink' has been a factor in child betterment.

Degeneration and Disease of the Nervous System Due to Alcohol

One of the most difficult features of the effect of alcohol to present statistically is its influence upon degeneration and disease of the nervous system. How far alcoholism is a cause or result of mental degeneracy is a constant source of argument. One thing is clear, and it is that mental degeneracy of all kinds and alcoholism are found in the closest association. We need add nothing here to what has already been written concerning sub-acute and acute alcoholism, and allied conditions clearly and unequivocally due to the excessive use of alcohol. Suffice it to remember, that alcoholic indulgence may be a co-operating factor when it is not the primary cause in a great many cases of mental illness. The depression, confusion, maniacal excitement and delusions which are found as predominant features of many forms of insanity are often made worse through the co-operating agency of alcoholic indulgence. Then, too, alcoholic indulgence often leads to uncontrolled storms of motor activity, and in certain forms of spirit drinking epileptiform attacks are frequent. Consequently we find very often a close association between epilepsy and alcohol.

When we come to study the available statistical information concerning alcoholic insanity, the first thing that strikes us is the remarkable decrease in definite primary alcoholic insanity. With the decrease in consumption of alcohol there has followed a most remarkable parallel decrease in admissions to mental hospitals for alcoholic psychoses, as they are termed.

But, at the same time, current statistics show that increase in the consumption of alcohol is practically always followed by an increase in cases of alcoholic phychosis, delirium tremens, and allied conditions. In pre-war days the Board of Control (Lunacy) claimed that 25 per cent. of the cases of insanity were due to alcohol, but there has been a constant and progressive decline in recent years, with the decreasing consumption of alcoholic beverages.

In 1920, the Board of Control (Lunacy), in their eighth Report, refer to a special investigation made on 3,494 cases of insanity, of which 1,132 were males and 1,176 females—all suffering from 'first attack.'

The investigation extended to five principal forms of insanity, four of which have as one of their principal features conditions such as we have just referred to, viz. depression, confusion, excitement, and delusion. The three main causative factors were alcoholism, prolonged mental stress, and insane heredity.

FIVE PRINCIPAL FORMS OF INSANITY

The Causative Factors	*Confusional Insanity.* M. 93 F. 119 *Cases*		*Primary Dementia.* M. 73 F. 53 *Cases.*		*Melancholia.* M. 202 F. 260 *Cases.*		*Mania.* M. 127 F. 164 *Cases.*		*Delusional Insanity* M. 142 F. 132 *Cases*	
Alcoholism (Toxic) -	25.2	6.7	—	—	7.3	2.6	15.9	3.5	13.7	6.7
Prolonged Mental Stress	21.9	16.5	30.7	16.0	33.7	24.9	23.9	25.0	26.4	25.1
Insane Heredity -	9.8	12.8	20.7	24.0	15.2	19.3	18.2	18.5	15.9	16.1

Note what a constant and important factor is prolonged mental stress in every form of insanity. In how many of

these cases had the durability of the brain tissue been weakened by ancestral drinking or individual indulgence although not necessarily recorded in the case history sheets? Incidentally we may mention that in the adolescent period a great strain is thrown on the nervous system, and 24-30 per cent. of the cases of primary dementia gave adolescence as a causative factor. Note, secondly, the place of alcohol; of 93 males suffering from confusional insanity, in 25.2 per cent. alcoholism was the main factor and in only 9.8 per cent. was there a definite history of family insanity. This statement must be quoted exactly and with caution—it does not say that 25 per cent. of insanity is due to alcoholism, but that it was a main factor in certain specially investigated cases of confusional insanity.

INSANITY AND ALCOHOLISM (ENGLAND AND WALES)

Year.	*Total Admission Direct.*	*Males.*	*Females.*	*No. in which Alcohol was Principal Cause.* M.	F.	*No. in which Alcohol was Primary or Secondary Cause* M.	F.	*Total Percentage of all Admissions due to Alcohol as a Primary or Secondary Cause.*
1894-98	18,437	8,967	9,470	—	—	22.4 1,991	9.4 886	15.6
1909-13	21,833	10,402	11,431	—	—	20.9 2,171	8.7 990	14.5
1915-19*	11,762	5,576	6,185	—	—	13.8 752	5.7 350	9.5
1920-24	22,204	9,963	12,241	653	265	10.9 1,091	3.5 439	6.8
1927	21,612	9,661	11,951	513	182	8.2 801	2.8 336	5.2

* Based on a return from 60 per cent. of the County Borough Asylums, which may be taken as an index of the condition of country as a whole. Sixth Report, Board of Control.

The raised figures in columns 6 and 7 are percentages.

We pass to alcoholic psychoses, that is to say, conditions of mental disease in which alcohol was a primary and principal cause or a secondary and contributory cause. Here we come upon one of the great changes which has accompanied a decreasing consumption of alcohol. This matter is of such vast importance that we publish the figures in full as recorded in the annual reports of the Commissioners in Lunacy and the Board of Control.

Insanity in Ireland formed a notable point in previous editions of *Alcohol and the Human Body,* and although, as far as it is revealed in recent statistics, Waterford (see page 121 of last edition) still holds a not very enviable position, the figures of to-day are not comparable with those of the past, owing to different method of presentation. Thus, up till 1911, the lunacy figures referred to the total number in the asylums at the date of the census; since 1911, the figures are given for each year.

INSANITY IN IRELAND (WHOLE OF)

Year.	*Total Number in Mental Hospitals.*	*Due to Intemperance.*	*Per cent. of all inmates.*	*Average Yearly Deaths from Intemperance and Rate per 100,000.*	
Census 1881	18,413	297	1.6	} 371	10.7
1891	21,188	671	3.1	} 425	13.1
1901	25,050	1,069	4.2	} 502	16.0
1911	28,437	1,347	4.7		
	Admitted During Year.		*Per cent. of Year's Cases.*		
1926	3,592	223	6.2	163	5.4

Here we see the increasing alcoholic insanity up till 1911, and now (1926) it approximates to the figures for England and Wales.

The next table enables a comparison to be made for the whole Kingdom. For the Scottish figures I am indebted to the superintendents of the various asylums in Scotland, who, without exception, sent the particulars on request, as they are not published in official Government returns.

ALCOHOLIC INSANITY
GREAT BRITAIN AND IRELAND (1926)

Country.	*Total Direct Admissions.*	*Males.*	*Females*	*Alcohol a Primary Cause of Insanity.*		*Alcohol a Primary or Contributory Cause.*		*Total per cent. of all Admissions.*
				Males.	Females.	Males.	Females.	
England and Wales -	21,618	9,627	11,991	5.2 507	1.8 227	9.0 867	3.6 433	6.0
Scotland -	3,148	1,597	1,551	8.0 129	1.8 28	14.0 225	3.9 61	9.0
N. Ireland -	1,000	530	470	2.4 13	2.3 11	8.4 45	3.1 15	6.0
Irish F. State	2,592	1,460	1,132	7.1 105	0.6 7	9.8 144	1.6 19	4.7

We note that while Scotland has this higher percentage than England and Wales, the figures have come down rapidly in recent years. Two of the superintendents sent very full particulars, from which the following figures are compiled:

1908-1912. The percentage of Primary Alcoholic Psychoses was 5.0 and 15.0.
1914-1918. The percentage of Primary Alcoholic Psychoses was 10.0 and 17.9.
1923-1927. The percentage of Primary Alcoholic Psychoses was 5.9 and 5.7.

The late Sir F. W. Mott called attention to the fact that cirrhosis of the liver was found comparatively rarely in mental hospitals. Scottish figures are interesting. Scotland has a heavier alcoholic insanity rate than England and a higher per capita consumption of spirits rate; yet England has a higher cirrhosis of the liver rate coupled with a lower alcoholism and insanity rate. It certainly looks as if spirits had little effect on the tough Scottish liver, but a marked effect on, shall we say, the more subtle Scottish brain?

A Comparison.

AVERAGES FOR THE YEAR 1922-1926.

	Cirrhosis of the Liver Death rate per 1,000,000	*Alcoholism Death Rate per Million per Cap. Cons. of Spirits.*	*Insanity Percentage Alcoholic.*
England and Wales - -	4.7	3 (0.29)	6 (1926)
Scotland - -	3.2	12 (.57)	9 (1926)

In considering these figures it must be borne in mind that they refer only to certifiable insanity, and when we hear it said and say, that alcohol to-day is not a great cause of insanity, the word certifiable should always be inserted and stressed. There are a vast number of border-line cases, cases where the mental deterioration is so extreme that the patients are more than a burden to themselves and friends. Homes are broken, distress is caused, but under the terms of present law nothing can be done; legally, these patients are not insane, but they are all profoundly altered individuals, and the wretchedness and misery they cause,

and the destroyed brain tissue they represent far outweigh the 6 per cent. who are certified.

Indeed, we can ponder the words of a very wise mental specialist who was in no sense wedded to total abstinence, who said: "It is literally and exactly true that drunkenness is insanity; that as long and as far as a man is drunk, so far and so long he is insane. . . . Alcohol is but one of the poisons that may produce insanity . . . ; from whatever point of view we regard drunkenness, we cannot fail to see that its nature is that of a transient and toxic insanity."

In view of the internationalism of the drink evil, these figures concerning certain European nations are noteworthy, all of them from national official publications, except those of Switzerland, which were very kindly obtained for me by Dr. Hercod of the International Bureau Lausanne.

INSANITY AND ALCOHOL (1926)

Country.	*Total Admissions to Mental Hospitals*	*Males.*	*Females*	*Alcohol the Primary Cause of Insanity.*		*Percentage of all cases where Alcohol was either Primary or Secondary Cause of Insanity.*
Germany -	123,633	72,514	51,119	11.9 8,641	1.1 566	17.1
Belgium -	4,038	2,108	1,930	6.3 133	0.6 12	(Primary) 3.5
Switzerland -	3,374	1,820	1,554	16.9 308	2.8 44	(Primary) 10.4
Hungary -	2,513	1,457	1,056	7.6 116	0.3 4	5.4
Sweden -	2,463	1,195	1,268	2.4 29	0.07 1	2.9

(Raised figures are percentages.)

These figures refer only to 1926 for comparison with our own. An extensive study of European figures shows that alcoholic consumption and alcoholic psychoses and other forms of mental illness rise and fall together.

We focus our attention on Germany, partly because there is much reliable information, and partly because Germany has been increasing her consumption of alcohol (at any rate in certain areas), especially in the form of a more strongly alcoholic beer.

Since 1919 the total beer production has varied year by year from 2,945,800,000 litres (a litre=1.76 pints) to 3,123,500,000 litres in 1922, a drop owing to economic conditions and inflation in 1923 to 2,823,000,000 litres, and then a gradual rise to 4,837,600,000 litres in 1926. These figures, massive as they are, do not convey the whole truth, because the alcoholic content has increased very considerably. Thus, if the production of beer in 1919 be represented by 100, that for 1926 is 160; but if the alcoholic content be 100 in 1919 then in 1926 it is 730. It is of course this increase in absolute alcohol which is the menace and the deteriorating factor. (See Dr. Johannes Thiken's *Handbook,* published by Neuland-Verlag, Berlin.)

The per capita consumption of this steadily increasing stronger beer has been, 1919—litres per head, 38; and then in successive years, 34, 57, 54, 51, 61, 75, to 76 litres per head in 1926 (and is said to be increased for 1927, official figures for which are not yet available).

The consequent or coincident increase of alcoholic mental disease is shown in these figures:

Receptions in Psychiatric Clinic, University of Leipzig, increase year by year from 22 in 1919 to 133 in 1922, drop to 75 in 1923 (see above), increasing gradually to 210 in 1926.

Similar figures for University Clinic, Kiel, run from

1919, cases 21, then year by year, 40, 88, 153, 89 (the same 1923 drop), 136, 141, 121.

From another angle, Municipal Institutions of Dresden: From 1908 to 1914 the yearly average of 270 drink cases was 23.6 per cent. of all admissions, 1915-19 the yearly average dropped to 50 cases or 6 per cent., gradually to rise to 428 cases in 1926, being 21.1 per cent. of all admissions. These figures confirm and are confirmed by the German official statistics given in the table on page 46.

That they are not isolated is evidenced by the returns from ordinary welfare centres where alcoholics are treated. From twenty such centres there is a marked increase since 1921. Of course, part of this may be due to more patients coming for treatment, yet the increase seems too great. These twenty centres have treated during 1921-25 upwards of 3,867 cases. If the conditions for 1921 be taken as 100, then succeeding years are represented by 172, 194, 224 and 318.

Lastly, in America, the nineteen registration States with the highest rate for cirrhosis of the liver had 72.2 per 100,000 population first admissions for lunacy in 1922, and the nineteen States with the lowest rate for cirrhosis had 62 per 100,000 first admissions, the average for the whole of the U. S. A. being 66.9 per 100,000. So far as alcoholic psychoses were concerned, thirty-four States made returns.

The seventeen with highest cirrhosis rate had 4.3 per cent. alcoholic psychoses in 1922 and 11.5 in 1910.

The seventeen with lowest cirrhosis rate had 2.3 per cent. alcoholic psychoses in 1922 and 7.3 in 1910.

It is sometimes claimed that the decrease in alcoholic psychoses at mental hospitals is due to the fact that they pass into 'observation wards' and into general hospitals more frequently than in the past. This is not borne out by the available evidence. Through the kindness of Dr. I. MacKenzie, of Glasgow, I am able to give these figures

from the 'observation' and early treatment of mental cases. In 1926 and 1927, 1,272 cases were under care and there were 53 alcoholic cases, 40 males and 13 females. Alcohol was the primary cause of insanity in 4 cases, secondary to depression in 5 cases, secondary to other mental states 6 cases, delirium tremens 6 cases, chronic alcoholics 10 cases, and 'simple drunks' 22 cases. Thus 4.1 per cent. of all the cases under observation were definitely alcoholic.

To sum up this statistical vignette. With a decreasing consumption of alcohol there is a decreasing number of alcoholic psychoses. With a higher relative consumption of alcohol a higher insanity rate. Where restrictive legislation limits the facility for obtaining drink insanity and alcoholic psychoses are less than in other areas unrestricted.

Alcohol and Epilepsy

The relationship between alcohol and epilepsy is one of the most difficult to unravel, a problem which needs extreme caution in the use of any individual statistics one way or another.

Quite obviously, and without any reservation whatsoever, the prevailing indulgence in alcoholic liquor is responsible for a vast unmeasured amount of mental disorder, disease, and deterioration. But when we come to assess the influence of alcoholic indulgence in the community, and especially in the ancestry, as a cause of disease in the offspring, we need to know something which is very difficult to obtain, viz.: How many so-called normal people have 'drink' in the family, as we say? Certainly there are a vast number. If we say that out of 200 epileptics, 5, 10, or 100 had drunken parents or grandparents, we still need to know what proportion of all drunken parents and grandparents have epileptic children, and also how many epilep-

tics are there in the offspring of normal parents. We stress this point, because no gain is to be derived from unbalanced or exaggerated or merely personal 'impressions,' and because the whole effect of alcohol on the national life is so disastrous that we are not dependent upon any one fact to urge upon legislators, doctors, and social workers the most strenuous and if need be self-sacrificing campaign against the drink menace. Speaking personally, we are so convinced of the magnitude of the evil, that we subject every statement against 'drink' to the most rigorous scrutiny, and venture to suggest that the pro-alcoholist should do the same with regard to the specious claims made for drink. The issue before us concerning epilepsy and to a certain extent feeble-mindedness is:

(i) Is epilepsy directly inherited, and, if so, in what proportion of the cases?

(ii) Is epilepsy found particularly in the offspring of the insane?

(iii) How far is alcoholism in parents a causative factor of epilepsy in offspring?

(iv) Is epilepsy a result of personal, individual alcoholism?

Before attempting an answer to these queries, what is the extent of epilepsy in the national life? Various computations have been made.

From figures supplied to the Royal Commission, based on the ascertained number of epileptics in London, Birmingham and Bradford areas, about 0.7 per cent. of the population of school children were epileptics. Other estimates gave 1.0 per cent., of which about one-sixth were severe. According to certain returns ('Report upon the Physical Examination of Men of Military Age,' November 1st, 1917, to October 31st, 1918. H.M. Stationery Office, 1920), in Barnsley, London, Liverpool, and the West Mid-

land areas, 96,344 men were rejected or placed in grades iv, v (ages 18-51), out of 351,530 examined. Of these 2,042 were rejected for epilepsy, *i.e.*, 2.1 per cent. of the rejections and 0.5 per cent. of those examined. These figures approach those of the Commission.

With regard to age of onset. The late Dr. Clouston said 51 per cent. of all epilepsy began before 14 years, and 95 per cent. before 25 years. Drs. Bond, Turner, and Gaskell all gave 50-54 per cent. before 14 years. Dr. Bond said 23 per cent. after 25 years, W. Aldren Turner, 19.7 per cent. after 25 years, and Dr. Bond also added "nearly all cases after 35-40 are due directly to alcoholic excess or syphilis or both combined" (*Report of Royal Commission*, p. 312). Küffner (*Journal American Medical Association*, February, 1928) found 30 per cent. of 2,000 cases began before the 20th year, and even among these 8 per cent. men and 1.3 per cent. women were noted as drinking to excess. With this early age-incidence of epilepsy, obviously the personal influence of 'drink' is reduced to a minimum.

As to the causation of epilepsy, W. Aldren Turner has reported two series of cases, the second being specially concerned with the effect, if any, of ancestral drinking.

	First Series.	*First Series.*
No hereditary cause known in ancestors - - -	330 or 49.0%	106 or 49.5%
Epilepsy in ancestors - -	252 or 37.2%	81 or 37.8%
Insanity " - -	37 or 5.4%	7 or 3.2%
Alcoholism " - -	21 or 5.3%	15 or 7.0%

This carefully made enquiry revealed a total average of ancestral epilepsy in 37.5 per cent., insanity 4.3 per cent., alcoholism 5-7 per cent., and there were no less than 49 per cent. in which no antecedent cause could be found.

Snell, of Munich, on the other hand, has reported 352 cases in which he found ancestral insanity in 50.79 per cent., and ancestral alcoholism in 25.89 per cent., there being some hereditary taint in 81 per cent. of all the cases.

Muskens, of Holland, in his recent book, analyzes 2,000 cases, of which 190 yielded insufficient evidence as to causation; of the remainder, he found: epilepsy in ancestors 646 or 35.1 per cent.; insanity in ancestors 263 or 13.1 per cent.; alcoholism in ancestors 111 or 5.5 per cent.; and alcoholism in the patient 50 or 2.5 per cent.; syphilis and other conditions accounting for the rest.

These figures reveal a diversity of opinion concerning alcohol, which varies from 5.3 per cent. to 25.8 per cent.

Scattered through the literature of the subject are a number of isloated observations of varying degrees of value (many quoted by Holmes). Thus, Sollier (1889) examined 350 families of alcoholics, one member of which had been in the asylum for epilepsy. He found that 209 of the families had no ancestor acknowledged whose condition would account for the alcoholism. 141 of the families had the alcoholism linked with various hereditary conditions. Sollier says of them: "the epileptics were all degenerates of a low order, idiotic, incompletely developed, feeble as well as epileptic." Whatever else there may have been, there is surely evidence of an extreme *blastophtoric* effect and probably the operation of one of those vicious circles in life which are so difficult to measure.

Stocker (1910) examined 115 patients admitted with delirium tremens, 34 had more or less regular epilepsy, and in 32 the 'epilepsy began before taking alcohol to excess' (but see Musken's opinion below).

Barr had 250 insane epileptics, 15 had ancestral alcoholism, whilst Martin had 83 alcoholic histories in 150 similar insane epileptics.

The late C. W. Sullivan found 4.1 per cent. epileptic in 219 children of alcoholic mothers. (Dr. Demole (Geneva) records (*Revue Med. de la Suisse Romande,* 1922) that in 1906-1908, out of 160 alcoholics, 47 or 30 per cent. were epileptic, and in 1909-1920, out of 563 alcoholics, 106 or 18 per cent. were epileptic.

An interesting piece of work is recorded by Thom (*Boston Medical and Surgical Journal,* 1916) from the Monson State Epileptic Hospital. Of those discharged which could be followed up, 136 subsequently married and had 553 offspring, in whom there were found 10 cases of epilepsy, 1.8 per cent. Of the 10, 6 died in infancy, 2 became confirmed epileptics, 2 cases had been arrested for 17 and 30 years respectively. On close examination of parents and children he found that epilepsy was transmitted and inherited in 5.8 per cent. of the cases."

Dr. Blümke, writing from Bielfield in 1928, says, "we have at present 2,086 convulsive patients, not all epileptics. Mental ailments or epilepsy are found on the average (approximate estimate) in about 27 per cent. to 30 per cent., alcoholism in the ancestors in 20 per cent.

Notkin (*Journal Nervous and Mental Diseases,* vol. 67, May, 1928), in 40 female cases, where evidence was fairly complete, found a history of parental alcoholism in 32.5 per cent. of the cases.

EPILEPSY IN VARIOUS COUNTRIES

Family History of Various Conditions.	*Turner (English).* 890 *Cases.*	*Snell (German).* 352 *Cases.*	*Binswanger (Germ.).* 150 *Cases.*	*Leverine (French).* 350 *Cases.*	*Spratling (American).* 1,070 *Cases.*	*Muskens (Holland).* 2,000 *Cases.*
	Per Cent.	*Per Cent.*	*Per Cent.*	*Per Cent.*	*Per Cent.*	*Per Cent.*
Epilepsy -	37.0	22.5	11.0	21.2	16.0	32.3
Insanity -	4.8	50.7	29.6	16.8	7.0	13.0
Alcoholism	3.1-7.0	25.8	22.5	51.6	14.0	5.5

Taking all the records as of equal value we can answer our queries:

Epilepsy said to be inherited in from 4 per cent. to 37 per cent. of the cases.

Epilepsy in the children of the insane in 7 per cent. to 50.7 per cent. of the cases.

Epilepsy as a result of parental alcoholism 4.0 per cent. to 51.6 per cent. of the cases.

Epilepsy as a result of personal alcoholism 2.5 per cent. to ? of the cases.

With regard to alcoholism in the parents, Muskens says: "Alcoholism in parents or grandparents is a definite predisposing factor; alcohol used to excess or syphilis may induce such constitutional changes that epilepsy may result apart from predisposing causes. It is further not infrequent to find where a patient has a definite predisposition to epilepsy (presumably an unstable nervous system), that a single dose of a toxin, such as a bout of drinking or an infection with syphilis, will precipitate epilepsy. Fits recur and at each recurrence require less and less stimulation. The influence of alcoholism of the parents on the genesis of epilepsy is a point on which workers are not agreed. When a patient is a chronic epileptic, a small dose of alcohol is one of the most certain means to provoke a fit. Cases have been known where an epileptic patient with minor epilepsy (*petit mal*) has displayed an epileptic psychotic condition or a severe fit after the first dose of alcohol."

What is our final answer to be? It is that whether heredity, or damage to the germ-plasm, or environmental error is the prime cause, alcohol and alcoholism is a very grim fact and a great reality or possibility in all these histories. Even Muskens says, "A single bout of drinking may initiate epilepsy," and W. Aldren Turner says, "That

conception under the influence of drink may be a cause of epilepsy in the offspring." Hence we feel justified in claiming that epilepsy is broad-based on heredity alcoholism, and bad environmental conditions, whilst alcoholism is certainly due to alcohol; the other two may be, and indeed often are, whilst, if they alone are present, alcohol if introduced can but fan the flame.

Whether we look at the question from the point of view of eugenics or euthenics, alcohol and alcoholism is a menace.

We cannot do better than close with the oft-repeated, but none the less valuable, words of the late Sir F. Mott:

"Alcohol, even in comparatively small quantities, may convert the potential lunatic into a raving maniac, and it is especially dangerous to the epileptic and feeble-minded, leading in the former to the production of motor and mental fits, and making him irresponsible and anti-social and sometimes very dangerous to himself and others. The amount of alchool which is daily consumed by the pillars of Society is quite sufficient to convert an epileptic or potential lunatic, or certain feeble-minded individuals into criminal or certifiable lunatics."

[*References.*—(1) *The report of Royal Commission on the Feebleminded*; (2) *The Morrison Lectures,* W. Aldren Turner, 1910; (3) *Discussion at Royal Medical Society,* 1927; (4) Myersen's *Inheritance of Nervous Disease*; (5) Holmes, *The Trend of the Race*; (6) Muskens's *Epilepsy,* 1928, and Kinnier Wilson, *Neurological Problems,* 1928, Tredgold's *Mental Deficiency,* to all of which a general acknowledgment is made. See also *Nat. Temp. Quart.,* Nos. 81, 82.]

Mental Deficiency

One of the most difficult problems to unravel is the relationship between alcoholism in the ancestry and mental deficiency and feeble-mindedness in the offspring. As with epilepsy so with mental deficiency, the figures given vary enormously, so much so, indeed, that one hesitates to use any figures at all.

There are known to Local Authorities 61,522 mental defectives. On January 1st, 1928, the number of cases dealt with under the Act in institutions was 20,429, and at a moderate estimate the Board of Control considers that accommodation for 39,067 as the lowest minimum is required.

The returns made by various Local Authorities vary from 0.03 defectives per 1,000 population to 4.66. This variation is probably more a reflex of the activity of the Local Authority than a true index of local variations (except to a certain extent in some places), and depends essentially upon a realization of the importance and gravity of the situation. The 14th Report of the Board of Control, 1928, p. 38, says: "Each year adds to the mass of evidence already in our possession that the untrained and uncontrolled defective, left to himself in a highly organized and competitive society, is a menace to the community; in youth he causes untold misery and expense, and in middle life is dependent on others for support. If the community could be convinced that in training and protecting the mentally deficient they are simply adjusting an old burden rather than creating a new one, they would not grudge the necessary preliminary outlay."

The Report gives a tragic summary of six feeble-minded married women, who gave birth to 31 children, of whom 29 were feeble-minded. Feeble-mindedness, speaking generally, may be said to be due to two causes, (*a*) intrinsic or hereditary, and (*b*) extrinsic or environmental. In the first case the condition is inborn, the result of some abnormal condition in the germ-plasm; in the second, it is due to some accident or disease operating upon what may be considered 'good stock.' In the first case, the defect seems to be clearly transmitted from generation to generation; in the second, the transmission is at least doubtful. But here

we are up against the difficulty that accident or disease may produce feeble-mindedness because it operates upon a local weakness.

There seems to be no doubt that alcoholism in the parent does produce such a condition of weakened resistance. Every child is born into the world with a stock of neurones, *i.e.*, brain cells and fibres; these neurones vary in their durability, the power with which they can stand up to the stress and strain of life. Alcoholism may lessen durability and thus be a factor in the production of feeble-mindedness, and if such an individual with undurable neurones 'drinks,' he will more easily succumb to the deteriorating action of the alcohol.

The present position seems to be an unresolved problem, but the revelation of a persistent fact, namely, that alcoholism and mental deficiency form two segments of a vicious circle, acting and reacting upon each other. Undoubtedly the offspring of alcoholics are more likely to be mentally deficient, and the mentally deficient very readily succumb to alcohol, but I have little patience with those who glibly state that all alcoholics are from the beginning essentially psychopathic or mental deficients.

The great question is, can alcohol, introduced into an apparently healthy stock, so affect the germ-plasm as to produce what is called a mutation, in this connection, leading to feeble-mindedness? Crew, in *Organic Inheritance in Man* (Oliver and Boyd, 1927), has a very wise and discriminating discussion of the whole question, especially pages 109 following, and page 150, to which we would refer our readers. He says, "Chronic poisoning with alcohol, in non-lethal and non-sterilising doses for example, may be expected to predispose the germ-plasm towards mutation" (p. 156).

From our special point of view there seems no doubt

that alcohol can, either through nature or nurture, either through hereditary conditions or environmental, produce, perpetuate, or precipitate a condition of feeble-mindedness.

But, while this is so, it seems quite clear that a most pressing social reform is needed, not to spend time haggling over this or that cause, but to recognize that the one great need is, (*a*) a quickening of public opinion and an awakening of the public Local Authorities to the very real menace of the feeble-minded in a modern community.

(*b*) Such a recognition of the danger as shall lead to segregation of the feeble-minded and the prohibition of parenthood.

(*c*) A continuance of an educational work and other agencies whereby the incidence of alcoholism may be still further reduced.

CHAPTER III

THE ACTION OF ALCOHOL ON THE SKIN

It is interesting to note that the 'skin' is derived from the same part of the developing embryo as the brain and nervous system. It consists of two main parts: (*a*) The epidermis, or scarf skin, sometimes called the stratum coneum, or horny layer. It is formed by cells closely dovetailed together, with no intervening space in several layers, which are constantly being renewed from below. These cell layers give the skin its power of resistance, and whilst unbroken it forms a great protective barrier against the entry of germs and other poisons. (*b*) The dermis, or true skin, sometimes called the corium. It consists of a framework of connective tissue cells, surrounding and supporting various important structures, viz. hair sacs, sweat and oil glands, blood vessels, lymphatics, and most important, sensory nerve endings which are exceedingly sensitive end organs for the reception of impressions, which, on conveyance to the brain, lead to the perceptions of touch, heat, pain, etc.

The chief functions of the skin are: (i) protection, (ii) excretion of waste products in the form of sweat, (iii) regulation of body temperature, and (iv) provision of sense organs.

There is nothing to add to previous statements concerning the last three of these functions.

The value of the protective function of the skin is receiving much attention to-day in industrial life, because of the somewhat considerable amount of sickness, absence from work and expense involved, owing to the prevalence of various forms of dermatitis or inflammation. Dr. Bridge, the Senior Medical Inspector (Factory Acts), in his last Annual Report, refers to this matter at some length.

The main causes of dermatitis are the daily irritations of the skin by the liquids or materials dealt with in industrial life. Workers in turpentine, alkali works, those who handle dough in bakeries, etc., are among the principal sufferers, although 'steamers' in the hat trade, and those who handle certain bulbs like tulips, roman hyacinths and the primula obconica, may be affected.

The great secret for the prevention of dermatitis lies in the preservation of the strong outer layers of the skin, by means of external cleanliness and internal purity of blood.

It is a fully recognized fact by most skin specialists that patients suffering from any form of skin disease do better without alcohol, or at any rate with alcohol reduced to the lowest minimum. Many dermatologists interdict alcohol entirely. Enquiry made among a limited number of doctors in industrial districts does not reveal any direct evidence as to the effect of alcoholism as an immediate cause of dermatitis, as seen in the ordinary skin department of hospitals, although there is little doubt that once a condition of inflammation is set up, alcoholic indulgence has an aggravating effect.

Dr. Body, Certifying Surgeon to the Home Office, investigated in 1926-1927 fifteen cases of epitheliomatous ulceration of the skin in pitch workers. One was a lifelong abstainer, one drank but seldom, thirteen were definitely alcoholic (in a communication to the author, 1928).

On reference to the *Decennial Supplement* (1921-1923),

published 1927, it is seen that in Class III., skilled workers, representing over 50 per cent. of all the occupied and retired males between 20 and 65 years, there were 71 occupational groups. Of these, 54 groups presented deaths from cancer of the skin. Thirty of these 54 groups had a death rate, from cirrhosis of the liver, lower than the average for their whole class; and twenty-four had a higher than average death rate from cirrhosis of the liver. The incidence of cancer of the skin in these two sets of groups is shown.

CANCER OF THE SKIN AND CIRRHOSIS OF THE LIVER

In 54 groups of Social Class III., ages 20-65 years

	Deaths from Cirrhosis of the Liver, C.M.F. Average.	*Death Rate per Million from Cancer of Skin (Average.)*
Thirty groups with low Cirrhosis rate	4.1	93.0
All Class III.	7.0	118.0
Twenty-four groups with high Cirrhosis rate	13.8	136.0

In the compilation of this table we have left out of calculation, puddlers, cotton operatives, and chimney sweeps (the former have a low cirrhosis rate, the two latter a high one), because they have such an extraordinary cancer of the skin rate, viz. 446.8, 907, 1,812 per million at ages 20-65 years. Here there seems to be a close correlation between cirrhosis of the liver as an index of alcoholism and cancer of the skin, and although the figures must not be pressed too far, they do point in a certain direction.

Once the protective barrier of the skin has been im-

paired, through irritant fluids or substances, or through exposure to great heat, alcoholic indulgence by producing vascular congestion and general impairment of the blood, may only too easily be a factor in the persistence of dermatitis, or the ultimate development of a cancerous condition.

The influence of alcohol upon the skin is also evidenced in a disease called pellagra. This disease occurs in Italy and in various parts of America, and there seems no doubt that alcoholism is a powerful factor in the causation of the trouble. The disease is characterized by a diversity of symptoms, mental disturbances, gastro-intestinal disorder irritation and inflammation of mucous membrane of mouth and profound changes in the skin. Although different observers vary in their statements of causation, all are agreed that whatever fundamental nutritional factor may be the cause, alcohol aggravates the condition.

The whole effect of alcohol upon the skin is due mainly to its general interference with metabolism and nutrition, and to its specific action on the small blood vessels where it causes vaso-motor weakness, leading to loss of tone and paralysis.

There is an old Jewish saying in the *Talmud,* "that the children of abstaining parents have no need to use cosmetics;" and we might commend the saying to parents and to the modern 'cock-tail' girl, whose skin is certainly never improved, and often coarsened, by alcohol.

CHAPTER IV

IS ALCOHOL A FOOD?

THE answer depends upon what definition of a food is adopted.

The Alcohol Investigation Committee recognized (*Alcohol: Its Action on the Human Organism*) the controversy that clusters around the subject, and claimed that alcohol is a 'food' and a 'poison' if the words are used with the meanings which they proceed to define. After discussing the nature and some possible definitions of food, and the classes into which food-stuffs can be divided, they finally created a class which necessarily includes alcohol. Indeed, as they say, alcohol is the only important constituent of an ordinary dietary belonging to the class. One wonders why the word important was used, since no other foodstuff is even mentioned to accompany alcohol in its singularity. After discussing the nature of oxidation, etc., they reach this preliminary definition of a food as "not merely something which is useful for the normal life of the body, it is a fuel which the body can use as a source of energy." Then just as one wonders how the difficulties with regard to alcohol fitting in to such a definition will be met, they say, "leaving alcohol out of account for the present," and proceed to deal with the normal classes of proteins, fats, and carbohydrates. Their properties of providing for growth, repair, and storage are noted. Then the question is asked:

"Are we to regard this power for storage as an essential character of a food and refuse to apply that term to substances which can be used as immediate fuel but cannot be changed into glycogen for storage?" "The question," they proceed, "is a very important one for our present purpose, because on the answer depends whether alcohol is a food or not. On the whole it has appeared to us more logical to admit that such immediate fuel substances are foods also, for although they cannot themselves be stored or changed into something else which can, by meeting the immediate demands of the body for fuel, they prevent the depletion of the reserve." But we ask, What and where are these substances with which alcohol is thus hypothetically linked as fuels for the body? The question is nowhere answered in the book, nor are any such substances ever referred to by those who have more or less accepted the Committee's position.

However, the Committee "adhere to the simple definition that a food is a fuel which the body can use as a source of energy."

We think the definition should contain a safeguard against possible detrimental action when such 'food' is taken in minimal amounts. But let that be for the moment. The Committee then proceed with two categories of foodstuffs, into which quite normally and properly and with universal consent, proteins, fats, and carbohydrates would be placed. Then follows a third category, *i.e.*, "One for substances which can serve as fuel but only for immediate use. They cannot be used to form new materials for the body's fuel reserve, but they can help to maintain that reserve by reducing the need for drafts upon it, and by allowing substances of another class to be used for its replenishment." Onto this category alcohol is placed. Naturally, with (*a*) their definition of a food and (*b*) their

creation of a special category to include it, alcohol becomes a food, from their point of view.

The Committee evidently felt the possibility of other views being held, and also the possibility of a misuse of their words and definition, hence these words follow: "If any one chooses to maintain that the word 'food' should be restricted to Classes I. and II., he is perfectly entitled to do so. He would then be justified in stating that alcohol is not a food, provided he made perfectly clear the limited sense in which he was using the word. . . . No one has the right to quote us as making the statement that alcohol is a food, unless he defines, as we do, the exact sense in which the word is used, and the limits within which the statement is true."

This right, allowed by the Committee, to maintain that alcohol is not a food, was exercised in the previous editions by Sir Victor Horsley and Dr. Sturge, and we, therefore, propose to continue that right.

Substances we use as foods act in several ways. In the building of tissue, in providing energy for muscular and mental work, in maintaining the heat of the body, in saving waste of the tissues; moreover, a food under normal conditions must do no harm to any organ or to the system as a whole. Following previous editions, a food may be defined as: Any substance which, when absorbed into the blood, will nourish, repair waste, and furnish force and heat to the body without causing injury to any of its parts, or loss of functional activity. Alcohol fails to fulfil these conditions. It is when we consider alcohol according to these properties of a true food we shall be able to assess its claim to be regarded either as a dietetic or non-dietetic substance.

I. The Building of the Tissues

Ordinary foodstuffs, such as milk, bread, meat, furnish the body with materials which, besides supplying storage capital, repair the daily wear and tear of the tissues, and are to be regarded as true building materials.

For the building of the tissues, Proteins, 'the citadel structures of the cell's life,' are absolutely essential to supply supremely the necessary nitrogen. There are many kinds of proteins, and much as protoplasm is differentiated in the various cells and tissues and organs, so proteins are differentiated. They are highly complex substances of varying composition, containing nitrogen and sometimes sulphur and phosphorus in addition to carbon, hydrogen, and oxygen. They owe their complexity to the fact that they consist of a series of what are known as amino-acids.

The simplest amino-acid is carbamic acid (NH_2COOH). It consists of two groups, NH_2, the amidogen group which acts chemically as a base, and COOH, the carboxyl group which acts chemically as an acid. Carbamic acid is derived from formic acid, H . COOH, where the H group has been replaced by NH_2.

The simplest amino-acid which has been derived from protein is glycocoll or glycine (NH_2CH_2COOH), which forms 25 per cent. of gelatine. Another comparatively simple amino-acid is alanine, also found in gelatine, and also forming 13 per cent. of the protein zein found in maize.

If we look at these two examples it will be seen that carbamic acid consists of two groups, NH_2 . COOH, but glycocoll consists of three, NH_2CH_2COOH. The amidogen (NH_2) and carboxyl (COOH) may be compared to the right and left hands, linking by means of the third group, CH_2.

If we designate this CH_2 group R, as representing any

kind of organic group, then a protein would consist of a number of amino-acids linked together thus:

$$NH_2\text{–}R\text{–}COOH\text{–}NH_2R\text{–}COOH\text{–}NH_2\text{–}R\text{–}COOH,$$

etc., remembering that the R group may be very complex itself, and may contain sulphur and/or phosphorus. The purpose of digestion is to break up the proteins into their constituent amino-acids. The process is a complicated one, but for purposes of teaching we might liken protein to a long word like Constantinople, a word which we want a child to grasp or assimilate. In order to do so, we break the words into syllables, Con—stan—ti, etc., or even into letters, C—o—n—. The word may be likened to a protein, the syllables to peptone or polypeptides, and the letters to simple amino-acids.

In order that the body may grasp and assimilate protein, it must be broken up into simpler substances. Quite briefly it may be stated that proteins are digested by the gastric juice into peptone, and then by pancreatic juice, etc., into amino-acids. These are carried by the portal circulation to the liver, and thence to their destination—the cells of the body—where they are used as the raw material for the cells' activity. The cells of the body need certain well-defined amino acids, which must be carried to them ready-made, and if not, then the body suffers. For a fuller account of protein, we must refer the reader to *Food and the Family,* by Dr. V. H. Mottram, and especially to *A Square Meal,* a most valuable book by Dr. Plimmer (published by Longmans).

Since alcohol contains no nitrogen it cannot repair or provide for growth, hence the statement that a glass of good beer is as nourishing as a glass of milk is not true; milk contains a valuable nutritive fat (cream), beer none. Milk contains a large amount of useful and nutritive sugar,

beer contains only a small amount of sugar, the rest of the carbohydrate being useless for purposes of nutrition. Beer contains about one-fourteenth of the protein found in milk, and even much of this is, to say the least, of very doubtful nutritive value. Milk, unless it has been contaminated through neglect and carelessness, contains no poison; beer contains a powerful poison, alcohol.

Then again, milk contains valuable vitamins; beer contains none, or practically so. Harden and Zilva claimed categorically that beer contained no vitamins. There followed a discussion in the *Biochemical Journal* on the whole question. Dr. Southgate claimed there was some vitamin B but no A or C, although the vitamin B had lost some of its power. Harden and Zilva returned to the attack and confirmed their previous position, that the processes involved in malting and brewing destroyed the vitamins B and C entirely. Dr. Southgate followed and explained how they were destroyed (*Biochemical Journal,* vol. xviii, 1924).

II. The Provision of Energy for Muscular and Mental Work

This is mainly secured by starches and sugar. Starches, whatever their source, are by digestion changed into grape sugar (glucose), first into maltose by saliva, and then by gastric juice into glucose. The glucose is rapidly absorbed, used as a ready source of energy or stored in liver and muscles as glycogen, and then used as needed for liberation of energy.

Now, alcohol and carbohydrates do not behave in the same way when ingested. The body can and does, within very wide limits, deal with an excess of sugar.

It converts it into glycogen, and then, when energy is needed, the glycogen is converted into lactic acid in the

muscles and energy is liberated. Now alcohol cannot be stored in the body for future use, but it can yield a certain amount of energy, and so it is in the limited sense of the Committee already referred to as 'fuel food.' From this strictly limited sense and point of view it has some value, in the estimation of a decreasing number of medical practitioners, in certain forms of illness. Alcohol as a medicine is, however, quite a different question from alcohol as a food, practically and economically, using the word food in the usual everyday sense. As a medicine, it is being rapidly replaced by other drugs, and especially by glucose, which not only yields energy very readily but seems to have definite power in strengthening the defensive forces of the blood against microbic invasion and disease.

Whilst alcohol absorbed into the blood can give energy, it has other properties, especially its narcotic action, so one has to be balanced against the other. The late Dr. Noel Paton's well-known words bear constant repetition: "A man may liberate the energy from the alcohol he consumes but long before any manifest symptoms are produced, his power of judgment and his power of directing the finer action of his muscles are so interfered with that he is unable to make full use of the energy, not only of that liberated from the alcohol but also of that liberated from his food, and thus his working efficiency is decreased." So that whilst, theoretically, the combustion or change of alcohol may liberate energy, its value as a really practically useful foodstuff is negatived by its narcotic action. Hence, men like the late Professor Starling, Lord Dawson of Penn, and others, bear testimony that the muscular and mental machines work better, more efficiently, without alcohol than with it. Surely a substance that produces less efficient working power cannot be described as a 'food,'

especially when we remember the words of the Royal Society's committee: "In buying food the population is buying energy, the power to do work."

III. The Provision of Bodily Heat

Fats in the diet are a main source of bodily heat. The fat in food is enclosed in fine pellicles which are dissolved in the acid gastric juice, and then, more slowly than other foodstuffs, the fat is passed on to the small intestine, where, under the influence of lipase and bile, the fats are changed into fatty acids and 'soaps;' these are absorbed and carried into the blood stream, and by the oxidation of fat, heat is liberated. Fats are not only a source of heat, but by carrying those important agents known as vitamins, they aid materially in the whole economy of the body and help it to resist disease. The pre-eminence of fat as a heat-producing agent is exemplified, not only in the amount of fat consumed by the Esquimaux, but in the fact that reindeer milk contains 17.1 per cent. fat as compared with about 3.7 per cent. in human and cow's milk.

There is almost unanimous consent that, while alcohol may on combustion yield a certain amount of heat, its other actions produce on balance a loss rather than an accession of heat. But even if the heat thus liberated by alcohol were not more than neutralized, it would be both foolish and extravagant to use as a fuel or source of heat anything which so markedly interferes with the well-being of the protoplasm of the body as a whole. "Sea water may be used in the boiler of a steam engine, and the steam from its evaporation will transmit the energy of the fuel to the revolving wheels, but its corrosive action on the steel forbids its use except in emergencies" (*Lancet*, Oct. 22nd, 1904).

So far then, proteins build, repair, and nourish tissues. Carbohydrates yield energy. Fats yield heat, and help in body metabolism. These three are absolutely necessary in some form; either in excess may do harm. They each have a specific and characteristic action on body changes and stimulate the body and its organs to functional activity. This action is known as the 'specific dynamic action;' the value of protein in this respect is represented by the figure 44, fats by 16, carbohydrates by 10, alcohol by 0. It has no specific dynamic action, or as Mellanby put it in his picturesque but scientific language, "alcohol adds no brightness to the flame."

IV. The Prevention of Tissue Waste and Protection of Protein

The question, Can alcohol save tissue waste? has been the shuttlecock of much physiological investigation since 1850. The point is this: if the food supply is deficient, the body uses up its own protein in order to carry on, and causes waste of tissue. Protein in the diet prevents tissue waste, but the amount of protein necessary can be reduced if the right balance of fat and carbohydrate, either or both, is used.

The question is: (*a*) Can alcohol save tissue waste and (*b*) replace fat and carbohydrate in protecting protein?

Generally speaking, until 1903 the weight of opinion was that alcohol caused rather disintegration and waste of protein than protection.

In 1903 Atwater published his much quoted (it is doubtless if it has been so much studied as quoted) work, *The Nutritive Value of Alcohol.* The reservations and cautions and qualifications are rarely mentioned when quotations are made from his conclusions.

Atwater reviewed the results of seven experiments,

Muira, Schmidt, Newman, Schoeneseiffen, Chotzen, Clopatt and Rosemann, and concluded that they showed:

(*a*) That alcohol sometimes protected and sometimes failed to protect protein.

(*b*) That where it failed to protect, a plausible theory is that it causes disintegration of protein.

(*c*) That the available data, including his own, would seem to imply that the carbohydrates are more efficient as protectors of protein than either fat or alcohol, and that as between the two latter the difference is in favour of the fats.

When we examine closely and in detail these seven observers' work, we find several factors which considerably vitiate any results one way or the other, *i.e.*, for or against alcohol.

First. The amount of protein given in the ration—it was of course the same in controls without as the others with alcohol—varied from 45 grammes in some experiments to 112.7 grammes in others. We know to-day what was perhaps hardly recognized earlier, that there is much more nitrogenous material in the urine when the diet is rich in nitrogen than in the reverse case. Thus a rich protein diet containing say 16.8 grammes of nitrogen yields 14.7 grammes of urea nitrogen, whilst a poor protein diet containing 3.6 grammes of nitrogen yields 2.2 grammes of urea nitrogen (Lusk). Now with such differences as 45 and 112 grammes in protein content, there are bound to be great differences in the nitrogenous metabolism, which really makes the series incomparable.

Second. The rations also varied greatly in their total caloric content. Thus in one the control ration contained 1,361 calories and the alcohol ration 1,820; in another they were 1,955 and 1,493; in another, 2,682 and 1,959; in an-

other, 3,402 and 1,959. The amount of metabolism that will occur with the fuller diet must differ from the other, and yield results which can give no scientific evidence concerning alcohol one way or the other. As a matter of fact, all the experiments showed some loss of body nitrogen, due either to conditions of experimental life or to the fact that the ration was insufficient.

When we turn from these figures to Atwater's own experiments and results, one thing is clear, viz. greater scientific accuracy and uniformity in amount of protein and caloric value.

Atwater's Experiments

A. Resting experiments with two subjects E. O. and J.F.S. Average length of period, 3-4 days.

B. Work experiments with same subjects.

	Available Income.		*Gain + or Loss — in body material Protein (grammes).*
	Protein (grammes).	*Energy (Calories).*	
A. Ordinary Diet -	106	2,496	—2.0
Alcohol Diet -	108	2,489	—3.8
B. Ordinary Diet -	100	3,337	—5.0
Alcohol Diet -	100	3,361	—9.8

Here then, quite clearly there is a greater loss of body material with alcohol than without, and especially when the subjects were at work.

There are in Atwater's paper many questions discussed, but we quote one or two qualifications which he made.

He says: "One thing impressed us, not only in these experiments but in others—it is, that the daily nitrogen

balance is a much less reliable indication of the effects of diet, drugs, or muscular work than is commonly supposed." All the latest work absolutely confirms this fact about nitrogen balance, even the non-medical reader can gain a good idea of the difficulty of the whole subject if he will read Chapter ii., *Nutrition and Dietetics,* by Dr. Cathcart, M.D., F.R.S. (Ernest Benn, Ltd., price 6d.)

Atwater says of his own experiments that the differences exhibited were all very small, but so far as they go "they imply that the alcohol was somewhat less efficient as a protector of protein than the fats and carbohydrates which it replaced." Again, "the loss of protein with alcohol was greater than the figures would indicate; it was larger under the influence of alcohol when the subject was at work than when at rest."

Summarizing the whole of Atwater's evidence it seems, over the whole range of experiments,

(1) that alcohol sometimes caused a definite disintegration of protein;

(2) that sometimes there was a greater loss, but still a loss with alcohol than with the control diet;

(3) that in some experiments conducted for a longer period, the more definitely disintegrative action seemed to pass into a protective one.

(4) that in the only experiments (Atwater's) which are really scientifically comparable, there was always a loss of body material, which was nearly twice as great in the working experiments with alcohol as when working with the ration without alcohol.

The whole question seems to me unsettled, and that there are not sufficient data upon which to make a pronouncement one way or the other.

In these four conclusions there is, however, insufficient basis on which to build the claim that alcohol is a true or

a practical food. It may be a combustible substance; it is not a nutritional one. Then, too, the other actions of alcohol—its narcotic effect, its power to hinder or interfere with oxidation, its effect on the water of the body—all militate against its claim to be a true food.

It cannot build, repair, or nourish healthy tissues.

It cannot provide energy for co-ordinated muscular or mental work.

It cannot provide heat.

It is very doubtful, to say the least, whether it can really save tissue waste. Reference has just been made to the effect of alcohol on the water of the tissues. In the syllabus, *The Hygiene of Food and Drink,* it is said that "alcohol is able to absorb water from the tissues of the body, and this explains why alcoholic drinks tend to make a man more rather than less thirsty."

At this point we may refer to a fact of experience. Many workers in industrial life, such as miners at the pit face, and those engaged in labour at great heat, say, that if they drink water on leaving work or after special effort, they suffer distress and internal cramp. True, very often the reason is that when a man sweats profusely he loses water, but, more important, he sweats out some of the saline constituents of his body. One of the reasons for a feeling of 'doneness' in such conditions is the depletion of the saline substances in the blood. If copious draughts of water are taken, then there is further dilution of blood and cramps may occur. Beer relieves, not because of the alcohol it contains but because in the 89 per cent. of water there are certain salines.

Dr. Oswald, Chief Medical Officer of the South Metropolitan Gas Company, realizing this fact, introduced a saline drink for the retort workers. At first they were suspicious; every moderate drinker will probably say nat-

urally. However, they tried it, and Dr. Oswald says it has now been introduced everywhere in the Company's service—retort houses, engine rooms, etc. The men are satisfied, and there has been a reduction of sickness since its introduction; cramp has been eliminated, with a greater sense of well-being at the end of each shift.

The prescription for the saline drink is: Potassium chloride 120 grammes, sodium chloride 180 grammes, water 1 litre. Two and a half litres of this solution are added to 213.3 litres (47 gallons) of water and it constitutes the drink. It should be kept in earthenware and not iron receptacles, and needs no flavouring addition.

Before closing this chapter, we feel that a few words on how these 'food' experiments are made, and how metabolism is measured, may be useful. There are five main methods employed:

(i) The calculation of food values by means of a bomb calorimeter. It is an instrument in which portions of foodstuffs are ignited by an electric current, so constructed that a certain measure of water absorbs the heat produced by the burning or oxidation of the foodstuff. The heat can be measured. It is found that 1 gramme (roughly 1/30 of an ounce) of protein yields 4.1 calories, of carbohydrate 4.1 calories, of fat 9.3 calories. (A calorie is a measure of heat, and the unit is the amount of heat required to raise a litre of water through 1° Centigrade.)

(ii) The calculation of human or animal metabolism as a whole, by means of the respiration calorimeter. This is an apparatus consisting of a chamber large enough for an individual to live in for a period. It is fitted with numerous devices so that the whole of his bodily economy, his metabolism, may be measured, *i.e.*, the amount of food, etc., eaten, of oxygen inspired, of CO_2 expired and excreta passed, the amount of heat generated and the work

done. A really high degree of perfection has been reached, but the one great drawback is that residence for a length of time becomes irksome. Much light has been thrown on the 'energy' effects of certain foods in this way.

(iii) Measurement of what is termed the respiratory quotient.

We can measure how much oxygen a man inspires, and how much carbon dioxide he expires. If we divide the latter by the former we get a certain figure—that is, the respiratory quotient.

The R.Q., as it is called, for starch and sugar is 1, for protein 0.81, for fat 0.71, for alcohol 0.66.

Now, with these figures the experiment can be conducted. The individual is allowed to live a normal life, and calculations are made as to the normal amount of food, oxygen inspired, waste products passed, etc.—in a word a balance sheet of income and expenditure. Then, all other conditions remaining the same, he is given in addition to, or in lieu of a part of his normal ration, some other material, say, protein, fat, or alcohol. Then a comparison of the balance sheets is made.

In this way certain facts have emerged: proteins, fats, carbohydrates, all definitely, regularly and consistently, stimulate metabolism; they have, as we stated, a specific dynamic action, and increasing amounts lead to increased metabolic activity.

In the *Journal of Pharmacology and Experimental Therapeutics*, 1917, vol. ix., there are a series of such observations recorded; one clear, dominant point is, that these true foodstuffs, definitely regularly caused a stimulation of metabolism and an increased consumption of oxygen. When we turn to alcohol, we are confronted with a very different picture, which we refer to later.

In all these experiments, the measurement was simply

of the 'energetic' or quantitative power of the foodstuff. To-day we know that 'quantity' is not sufficient—the foodstuff must have certain definite 'quality.' A body may have ample calories and yet die if the quality is wrong. Hence, there is

(iv) Measurement by feeding experiments to test the life-sustaining power, etc., of any foodstuff.

(v) The examination of the blood and urine after certain materials have been ingested has also given valuable results, especially when combined with other tests, such as the degree of acidity, etc., of the blood.

As a result of all this activity certain facts are established, briefly:

(*a*) Proteins, fats, carbohydrates, have a clearly ascertained energy and quality value, a specific dynamic action, and increasing amounts cause an increase of oxidative and other metabolic processes.

(*b*) Whilst proteins can be utilized in the body for repair, growth, and the yielding of energy and heat, it is more economical biologically and financially to reduce protein to a minimum and secure energy from fats and carbohydrates. Up to a point fats and carbohydrates can be used to replace each other in sparing protein, but a balance of all three is best.

(*c*) These basal foodstuffs are absolutely necessary for normal metabolism.

The metabolism of alcohol. When we turn to this a very different picture presents itself. (*a*) It seems settled that a great portion of the alcohol ingested is definitely oxidized in the body, much as other poisons are, and up to a certain point like normal foodstuffs. We say up to a point, because alcohol does not act like other foodstuffs in every way.

Take the respiratory quotient. With the foodstuffs

there is invariably a rise in the R.Q., a rise which increases with the larger amounts ingested.

Gephart and Du Bois found that 100 grammes of glucose led to a R.Q. at four hourly intervals, 0.91, 0.89, 0.88, 0.90; 200 grammes led to a R.Q. of 0.95, 0.93, 0.95. Now, with alcohol, Higgins found, first there was a fall of the R.Q., and what is most significant, the drop (in men resting) produced by alcohol was the same whether 35 c.c. or 45 c.c. were taken, so that the amount of oxygen used by the alcohol in unit time was the same in spite of varying amounts imbibed. As Mellanby said, "this conclusion is an important one and places alcohol in a different category from other non-nitrogenous foodstuffs."

Higgins found, too, that the drop in the R.Q. with alcohol was greater when the R.Q. before taking the alcohol was higher, which shows that the rate of metabolism of other foodstuffs is not the same before and after taking alcohol, that there is needed a depression and not an increase of metabolic activity.

Gephart also examined the R.Q. with increasing amounts of alcohol. We have seen that this increases with foodstuffs, indicative of heightened metabolic activity. He found with alcohol, uniformly, a lowering of the R.Q., hence a lowering of metabolic activity.

Does alcohol interfere with the oxidation of other material in the body, apart from these respiration experiments? The answer is yes. The late Professor Cushny in *Pharmacology and Therapeutics* says: "A much more distinct effect from small doses of alcohol, such as correspond to the temperate use in man, has been observed by Hunt, who finds that animals treated with alcohol become more susceptible to the action of methyl cyanide. This poison acts in the system by being oxidized to HCN (prussic acid), and Hunt believes that the effect of the pro-

longed treatment with alcohol facilitates this oxidation, and that the reaction is evidence of the alteration of the metabolism of the body in this direction. The great importance of this observation lies in the fact that the modification of the metabolism which it demonstrates arises from the prolonged use of quantities which are too small to give rise to definite symptoms of intoxication." (Hunt's work is recorded in *Hygiene Laboratory Report,* No. 33, Washington, 1907. It has been confirmed by Pickford (*Journal of Physiology,* vol. 63, 1927), who says: "I found no antagonism between cyanides and alcohol, but a combination of actions."

Cyanides profoundly depress all oxidations, and ethylic alcohol deepens their depressant action.

Hence, incidentally, the need of changing the recommended treatment for prussic acid poisoning in the *St. John's Ambulance Manual* current in ambulance circles, 1927-1928. Sir Thomas Oliver wrote (1927): "Since prussic acid poisons protoplasm and paralyzes the nervous system, I do not see how the administration of alcohol could pull a person round. The absorption of oxygen by the tissues is so profoundly diminished that to add another poison is only to retard still more the absorption of oxygen. I cannot commend such treatment. Sir William Willcox said: "The use of alcoholic stimulants in prussic acid poisoning is not only contra-indicated but is useless and positively harmful." Dr. E. Bosdin Leech, after consultation with Professor Wild, Professor of Pharmacology, said: "We do not see any scientific reason why alcohol should be given in prussic acid poisoning, and we cannot at all explain the reason of the writer who does suggest it."

To sum up:

(1) Alcohol taken as a beverage is admittedly not necessary to any healthy human body, as proteins, fats, etc., are.

(2) Experiments made with alcohol do not reach the same degree of consistency in results as do those with true foods.

(3) There is no really satisfactory evidence that alcohol can stimulate metabolism or oxidation, but a good deal that it can depress both

(4) Alcohol may possibly replace fat and carbohydrate in a diet for a short while, but there are no experiments to prove it can do so for a lengthened period. Where it does so it does it less efficiently than the things it has replaced.

(5) Alcohol has no specific dynamic effect, and, after a certain degree of concentration, hinders its own oxidation as well as that of other foodstuffs.

(6) Increasing amounts of alcohol do not cause a corresponding and proportional alteration in the respiratory quotient.

(7) The oxidation of alcohol in high concentrations in the blood, unlike real foodstuff, does not increase with exercise.

(8) It is changed, by oxidation or otherwise, slowly, and even at the end of eight hours some remains in the blood, after ingestion of 30 c.c. (Beckmann). Consequently, we adhere to the dicta of Sir Victor Horsley and Dr. Mary Sturge, and claim that while alcohol may be a 'fuel' food in the restricted sense of a peculiar and specially framed definition, it is, as the authors of that definition state, in no sense a practical food for healthy men and women, whose food is their source of available energy for the work of body and mind.

[References generally are made to a vast number of papers in the *British Biochemical Journal, Journal of Physiology,* and in American *Journals of Biochemistry, Experimental Therapeutics,* and the *Archives of Internal Medicine,* during past twenty years.]

CHAPTER V

THE EFFECT OF ALCOHOL UPON THE LIVER AND KIDNEY

It has long been recognized that one of the most marked results of alcoholic indulgence is seen in the effect of alcohol upon the liver and the kidney.

These organs, and especially the liver, are most intimately connected with many of the processes which underlie and accompany all those changes in the human body which we call metabolism, whilst the kidney is part of the great excretory system of the body, expelling in the urine many important chemical waste products.

The Liver is the largest gland in the body and performs a number of functions. It secrets and pours out a fluid, the bile, which passes into the upper part of the intestine and has important action in the processes of digestion, especially of the fatty foods. It aids in the storage of fat, which is liberated as necessary for body purposes. Another function is termed glycogenic, being that by which carbohydrate, sugar and starch, is altered and stored up in liver cells as glycogen. Under normal conditions the blood and muscles contain a certain amount of sugar, and it is important that the blood sugar level should be maintained at the right height. Consequently any excess of sugar is speedily transformed into glycogen, stored in liver and muscles, and then liberated as may be necessary when the

body makes a demand for energy. A fourth function is to assist in the metabolism of the protein part of the food, forming urea from certain ammonia compounds, and helping to destroy uric acid. Then again, the bile has important antiseptic actions and helps to detoxify poisons in the gastro-intestinal canal, destroying or rendering inert the bacteria which tend to accumulate and flourish in the canal. Lastly, the liver has a profound influence upon the metabolism of iron, which plays so important a part in the body, hence certain forms of anæmia are greatly benefited by the new 'liver treatment.'

These six great functions, all closely interrelated, are provided for by means of a special arrangement of blood vessels called the portal circulation. All nutriment absorbed from the stomach and intestines is carried by blood vessels to the liver; here these vessels break up into capillaries, and through these the partially digested food is carried to the liver cells. From the liver cells tiny canals carry the bile which is formed so that it may be poured into the gastro-intestinal canal. Both the blood vessels and these bile canals are lined with extremely delicate cells. When alcohol is taken by the mouth, it passes rapidly absolutely unaltered into the blood stream, and directly and immediately to the sensitive liver cells. It will readily be grasped that with such far-reaching interrelated functions any interference with liver cells must have a profound effect on bodily health in many directions.

The main interest with regard to the action of alcohol on the liver lies along two main lines: (*a*) First, there is the relatively minor action, in which alcohol always interferes with the function of normal cells, upsetting the balance of life and throwing a strain on the natural reserves of strength. We say this is a minor action, because of the extent of the natural reserves; but when we look at the com-

plicated functions which the liver cells fulfil, it can easily be realized that anything but the very strictest moderation must inevitably have serious results, not necessarily in the production of a disease which can be labelled as such, but in producing just that loss of tone which constitutes the difference between being 'quite fit' and 'out of sorts.'

(*b*) Secondly, there is the effect of continued doses of alcohol, especially if taken in the form of spirits, in the production of cirrhosis of the liver. From time immemorial the importance of alcohol as one of the outstanding causes of this condition has been recognized, and in all the great text-books of medicine alcohol is looked upon as the great cause.

There is, however, a tendency in some quarters to minimise the importance of the action of alcohol, and in all quarters a recognition that alcohol may be allied with syphilis and certain other toxic conditions in the production of cirrhosis. A careful survey of the literature leads one to say that probably 5 per cent. of all cases of cirrhosis are due to infective processes; in about 6 per cent. syphilis seems to be the main cause; cause doubtful, in probably 10 per cent. In these 20 per cent. of the cases alcohol may still be a co-operating factor. The remaining 80 per cent. are alcoholic, or alcoholic and syphilitic combined, in the opinion expressed in text-books but not necessarily in death certificates.

The Registrar-General continues to take cirrhosis of the liver as the index of alcoholism in the national life. In the *Decennial Supplement* (1927), the subject is fully dealt with. The *Supplement* states: "Cirrhosis of the liver will, despite the possibility of error involved, be discussed as an index of alcoholism." The class incidence of the disease is, for all occupied and retired civilian males 20-65 years of age, 9.6, and for the different classes from Class I. downwards, 15.6, 17.9, 6.3, 7.1, 8.3. "These figures

show that its incidence varies largely in accord with the financial means available for over-indulgence. As in the parallel case of diabetes, the highest mortality is returned by Class II., Class I. coming next. But whereas the evidence provided by diabetes points to continuous decrease of over-indulgence in food from Class II. to Class V., cirrhosis mortality is at a minimum for Class III., and rises again somewhat for Classes IV. and V., though not nearly to the level reached for Classes I. and II. It seems probable that the excess for Classes IV. and V. over Class III. is accounted for by deaths of men reduced to these classes by drinking habits, and if so the cirrhosis mortality of these classes may be regarded as representing the drinking habits of a more prosperous past. The general rule, therefore, seems to hold that alcoholism varies in proportion to the financial means of obtaining so expensive a luxury as alcohol, modified only in Class I. by some countervailing influence, possibly prudence, exceeding that of Class II., evidence of which appears where both food (diabetes) and drink (cirrhosis) are concerned."

It is noteworthy to see that the great mass of over 5,000,000 of the skilled workmen of the country show this smallest incidence of alcoholism. Of the 164 main occupational groups, seventeen show no deaths from cirrhosis of the liver during 1921-1923, whilst the six with the highest mortality are inn and hotel keepers, brewers, barmen, cellarmen, actors, and dentists, followed closely by authors, editors, journalists, and solicitors; then with other groups come proprietors of theatres, auctioneers, commercial travellers, photographers and registered medical practitioners, all within the thirty with the highest death rate from this cause. These latest figures bear out what Vernon stated for 1911-12 that the two groups who see most of the evil, doctors and solicitors, are high up among its victims.

Of the Trade, the Registrar-General says: "Publicans form part of a remarkable group of four occupations all concerned with alcohol, which return the highest comparative mortality figures. The significance of this fact admits of no doubt. Though publicans are the only representatives of Class II., they suffice to account for most of its excess mortality. The actual deaths for Class II. were 1,453, whereas at the rates for all occupied and retired civilian males they would have been 833; of this excess of deaths, 340, or 55 per cent., were furnished by this one occupation—(340 is reached by subtracting the 38 'expected' deaths from 378 actually recorded). Apart from publicans the C.M.F. for cirrhosis in Class II. would be 13.2, less than that of Class I. (15.6). It will be seen, therefore, that allowance for the phenomenal mortality of publicans, and for the effect of alcohol bringing its victims down to Classes IV. and V. before killing them, can fully explain the departures from the prosperity scale in the distribution of cirrhosis mortality. Broadly speaking, this disease costs money, and is incurred in proportion to financial resources." Or, as it has been said, in proportion to access to money in the till or to alcohol through the tap.

We need to remember of course that different individuals are affected in different ways by alcohol. In some the nervous system succumbs quickly, whilst in others, in whom the nervous system is more resistant, the irritant action of the alcohol upon the liver has time wherein to manifest itself, and so various disorders gradually arise.

One thing is very certain, and that is the marked decrease in the incidence of cirrhosis of the liver during the last 15 years. The table shows the deaths from cirrhosis (death rates per 10,000 in brackets), the convictions for drunkenness, deaths from chronic Bright's disease of the kidneys, and the consumption per head of population of beer

and spirits in 1913, 1919, and 1926 and 1927, the last year for which full figures are available.

ALCOHOL, CIRRHOSIS OF LIVER AND NEPHRITIS

(Registrar-General's Statistical Review and Licensing Statistics)

Year	*Deaths from Cirrhosis of Liver.* (*Death Rates per Population*).	*Convictions for Drunkenness.* (*Rate per* 10,000). *Population*).	*Deaths from Chronic Nephritis* (*Standardized*) (*Rate per* 10,000).	*Beer made, less Exports, Spirits retained for Consumption, Per Head of Population.*	
				Beer.	*Spirits.*
				Gallons.	*Proof Gallons.*
1913	2,674 (0.8)	188,877 (43.0)	3.9	27.80	0.57
1919	1,410 (0.3)	57,948 (16.0)	1.9	17.56	0.36
1926	1,732 (0.4)	67,126 (17.0)	1.9	15.75	0.25
1927	1,860 (0.4)	65,166 (16.5)	(Crude Rate, 3.1) ?	15.50	0.26

During 1910-1914 at King's College Hospital, London, 3.19 per cent. of the medical admissions were alcoholic cases (1.9 cirrhosis, 0.5 alcoholic neuritis, 0.7 other forms of alcoholic poisoning). During 1922-26 these figures were reduced to 0.69, of which 0.47 were cirrhosis, 0.12 neuritis, 0.10 other forms of alcoholic poisoning (Dr. Mapother).

These figures are confirmed in many directions. Fleischer of the Dresden Town Hospital, Germany, studied the occurrence of cirrhosis in a large number of post-mortem examinations. From 1909 to 1924, he noted in all, before the War, this disease constituted on the average 2.4 per cent. of the total number of post mortems. During the War the proportion fell to 0.7 per cent., to rise again from 1920, becoming 2.0 in 1923-24, that is to say, four-fifths of the pre-war proportion. The decrease during the War cannot be attributed to the absence of men on service, the proportion of female cases having remained practically the

same during the whole period 1909-1924, viz. 13 to 16 per cent. of the total number. Here cirrhosis of the liver falls and rises with the decrease and increase of alcoholic consumption.

The Kidney

Essentially, the elaborate mechanism of the kidney consists of an active filtering system of thousands of tubules, arranged closely side by side, whose function is to separate from the blood and carry away the waste material which otherwise would interfere with the vitality of all the tissues of the body. This paramount function of the kidneys in rapidly eliminating effete material is a function which cannot be too carefully safeguarded. Anything which interferes with its work will sooner or later cause retention of waste products in the system and will also permit the escape of the valuable albuminous substances of the blood, through the filtering apparatus. Alcohol has such an effect upon the kidney. In his book, *On Alcoholism, its Clinical Aspects and Treatment* (1912), the late Dr. Hare, Medical Superintendent of the Norwood Sanatorium for the treatment of inebriety, drew attention to the frequency with which albuminuria occurs in alcoholics. He found among 106 cases, still drinking on admission to the sanatorium, that 96 had albuminuria. This was considered by many a rather unusually high proportion, but he claimed that, if carefully looked for whilst the patient is still 'drinking,' and for a short time after, albuminuria will be found as a rule in small amounts, which falls steadily as the alcohol is withdrawn. Other things being equal, the percentage of albuminuria varies directly with (*a*) the amount of alcoholism, (*b*) the duration of the habit, (*c*) its continuity, and (*d*) with the strength of the liquor consumed.

Dr. F. S. D. Hogg, of Dalrymple House, Rickmansworth, has (June, 1928) kindly sent me these figures.

Out of 1,645 consecutive admissions, one group of 252 patients, average age 42 years, had 46 cases of albuminuria, and in 30 cases it cleared up under treatment; of another group 116 patients, average age 46.6 years, there were 17; and in a third group of 394, there were 77 cases with an average age of 46.4 years. The average length of the habit seems to have been about 10 to 13 years. Here, then, out of 762 patients, just over 18 per cent. presented signs of albuminuria.

Dr. Gordon, who has succeeded Dr. Hare, finds about 14 per cent. present signs of albuminuria, whilst Dr. Carver, Caldecote Hall, points out that if the patient is admitted at the end of a 'bout' albuminuria is generally present.

These practical experinces emphasize the point that long-continued alcoholism has a direct and most harmful influence on the kidney. In a lecture (*British Journal of Inebriety,* October, 1927) Dr. Godfrey Carter, Lecturer on Forensic Medicine, Sheffield University, says: "Apart from the small contracted kidney of the spirit drinker, I have come to recognize in the post-mortem room a distinct type of chronic inflammation. I have dubbed it 'beer-drinkers' nephritis.' It is seen in persons addicted to the taking of large libations of ale, and is usually associated with a very capacious stomach. The kidneys are large, red and hard, with no diminution of cortex (the outer layer of kidney), the capsule (covering the kidney) strips easily, and there is albumin in the urine. The renal filters are in fact overworked by constant excess of alcoholic and watery blood contents to be got rid of. Such persons withstand illness badly, as do all alcoholic indulgers, and their bodies find their way, not infrequently, to the public mortuary for detailed examination as to the cause of unexpected death from latent nephritis, pneumonia, or arterial degeneration.

That alcohol passes rapidly to and through the kidneys into the urine has been fully demonstrated by Drs. Godfrey

Carter and Southgate (*British Medical Journal,* 1926, p. 465, vol. i.) and by Dr. Miles (*Journal of Pharmacology and Experimental Therapeutics,* vol. xx., 1923).

Miles found from the summary of experiments on a modern drinker that, in from one to two and a half hours' following the ingestion of a litre (1.76 pints) of a 2.75 per cent. ethylic alcohol by weight, eleven blood samples gave an average of 0.21 milligrammes of alcohol per cubic centimetre of blood. Samples of urine taken coincidentally gave 0.40 milligrammes per cubic centimetre, which is 90 per cent. higher than the blood. The relationship between alcohol in the blood and urine is a very constant one as shown by the work of Godfrey, Carter, and Southgate, and is not materially modified by muscular work, quiescence, fasting, or presence of small amounts of food in the stomach. It almost looks as if the kidney were making an attempt to get rid of the alcohol as speedily as possible, and it enables us to realize how easily the delicate structures of the kidney may be damaged.

The Registrar-General says concerning chronic nephritis: "No less than four of the ten occupations with the highest mortality from chronic nephritis are also included in those for cirrhosis of the liver. This confirmation of the accepted view that alcohol promotes chronic nephritis is supported by the correlation value obtained for the comparative mortality figures for cirrhosis and nephritis of 162 occupations, viz.+.419+.044" (*Dec. Supplement*).

The connection between alcohol, cirrhosis and chronic nephritis, is to a certain extent confirmed when we compare the figures for Australia and Great Britain (for the period 1921-1925). Notwithstanding the greater expectation of life in Australia at all ages up to 80 years, there is a heavier death rate from cirrhosis and nephritis in proportion to population than in Great Britain.

COMPARATIVE FIGURES
AUSTRALIA AND GREAT BRITAIN
(1921-1925)

	Average per capita Consumption of Spirits.	*Death Rate per 100,000 (Crude).*			*Expectation of Life at*		
		Cirrhosis.	*Nephritis.*	*Suicide.*	*Birth.*	30.	50.
	Gallons.						
Australia -	0.41	5.3	50.5	11.2	59.1	38.4	22.2
Great Britain	0.34	4.6	33.2	9.2	55.6*	37.4	21.3

Many of the foregoing figures have been taken from the *Decennial Supplement,* 1927, but in 1928 in his *Statistical Review of England and Wales,* New Annual Series, No. 6, text (5s.), the Registrar considers these questions anew in reviewing 1926.

The findings and statements are so important that we refer to them here.

First, Alcoholism. The Registrar has assembled, on page 83, all the deaths certified as due to or connected with alcoholism. These make up a total of 498. The causes frequently associated with alcoholism (in death certification) were: cirrhosis of liver 132, violence 53, heart disease 51, lobar pneumonia 22. The abatement in deaths due to alcoholism noted in previous reviews continues. Applying total deaths of males to total male population, the crude male mortality from this cause (deaths attributed solely to alcoholism) is found to have fallen from 25 per million

* These figures are taken, or worked out, from "Life Table for England and Wales," *Decennial Supplement, 1927*; figures for 1921, *Australian Commonwealth Year Book,* No. 20. The actual population for each year, not an estimate, forms basis of calculation.

in 1914 to 3 in 1918, after which it arose to 9 in 1920 and now stands at 4. "The parallelism of this movement with that of average alcohol purchasing power is obvious."

"The more inclusive totals dealing with alcoholism in the wider sense, *i.e.*, with deaths attributed to other causes in conjunction with alcoholism have behaved much in the same way." The inclusive rate for all males in 1913 stood at 73 per million, in 1926 at 17. Females in 1913 stood at 46 per million, and in 1926 at 9. With regard to cirrhosis of the liver, the *Review* states (p. 98): "It is significant that while that returned as alcoholic fell from 10 per million in 1914 to 3 per million in 1926, the remainder, not returned as of alcoholic origin, fell from 102 in 1914 to 40 in 1919, since then rising to 44.

"This parellelism of movement during the period of restriction of the supply of alcohol provides strong statistical evidence of the importance of alcohol as a factor in the causation of cirrhosis, even when this is not returned in certification as of alcoholic origin."

Second, Chronic Nephritis. The Registrar-General points out that this is a disease especially fatal to old people, and so what is called the crude death rate, *i.e.*, one based simply on population, tends to rise because of the rapid ageing of the population. He has worked out, therefore, the standardized death rate, *i.e.*, a death rate based upon the actual number of people living at each age period. The result shows the marked fall in deaths from this disease since 1914. "Such a change," he says, "in so short a period, and occurring between the dates mentioned (1914-1926), inevitably suggests the influence of war conditions, but if so it has been maintained since the peace, for since 1919 the rate for males has fallen 13 per cent. and that for females 1 per cent. It may be recalled that mortality attributed to alcoholism has fallen in a very similar

manner, though of course to a much larger extent, during the years of war, and subsequently, like Bright's disease, substantially maintained the low level then reached.

"The returns compare as follows, using standardized rates for Bright's disease, crude for alcoholism, and deaths, not rates, for the very small mortality attributed to alcoholic nephritis."

	Males.			*Females.*		
	1914.	1919.	1926.	1914.	1919.	1926.
Chronic Nephritis	382	288	250	287	198	196
Alcoholism -	25	5	4	12	1	2
Alcoholic Nephritis -	28*	10†	9†	35*	2†	2†

"The parallel set up suggests that the connection between alcoholic excess and Bright's disease may be closer than might have been anticipated. Alcohol is commonly regarded both as a contributory cause of Bright's disease and as harmful to those who suffer from it" (page 100).

In his remarks the Registrar emphasizes the post-war-time cost of alcohol as a factor in the reduced consumption, but there is probably, as Lord Dawson of Penn recognized and stated in the House of Lords, the increasing effect of years of Band of Hope and other temperance teaching. Anyway, whether it be due to this or that or both, one thing is clearly established that these conditions of disease and death rise and fall with the consumption of alcoholic beverages.

* Chronic nephritis. † Acute and chronic nephritis.

CHAPTER VI

THE EFFECT OF ALCOHOL ON THE BLOOD AND CIRCULATION

SINCE the last edition of *Alcohol and the Human Body,* there has not been any very striking fresh light upon the effect of alcohol upon the blood, except perhaps along one line, viz. the importance of calcium and the possible action of alcohol.

The salts, such as sodium chloride, certain phosphates and other chlorides, together with minute but highly significant quantities of magnesium, phosphorus, iodine, iron, etc., are of vast and far-reaching importance. We stress that of calcium. It is found almost universally in all forms of living tissue. In plants, it has a great influence on the germination of seeds, stimulates growth, and gives tone and vigour to the plant. Hence plants watered with distilled water suffer. The proper absorption of and utilization of other salts depends upon the presence of calcium. In the human body, calcium is important in the coagulation of blood, clotting of milk, and as helping to form supporting and protective structures like bone and certain parts of the teeth. Man's daily requirement of calcium is said to be 1.5 gramme (1/20 oz.), and a sufficiency would be contained in about 1/3 of a pint of milk. The plasma of the blood contains about 10 to 11 milligrammes per 100 cubic centimetres, whilst in normal human milk there may be from 30 to 80 milligrammes, with an average of about 42 milligrammes.

The effect of alcohol on the salts of the blood is a field which has been little explored, but further investigation along this line will probably reveal one of the more subtle effects of alcohol on the human system. I have read somewhere, but cannot trace the source, that the calcium content and fat is reduced in the breast milk of alcoholic mothers. If this is so, and if confirmed by modern methods of examination, it will throw a great light on the debilitated condition of the infants of alcoholic mothers.

Speaking generally, all the more modern research work upon alcohol has been done with small, in some cases quite small, doses of alcohol, as for example Laitinen's work. Although the results all show some deterioration of vital activity, some disorder of function, they must not on the one hand be pressed too far, nor on the other hand totally neglected.

The body has large measures of reserve, and these may be drawn upon, even to a dangerous degree, and yet the 'front line' remain intact. Now, if a sudden demand is made upon the 'front line' to repel a sudden invasion by some germs, the margin between success and failure, recovery or death, will depend, in part at least, on the ability of the body to mobilize its reserves. If these have through any cause been attenuated, then collapse may occur.

Alcohol in quite strict moderation, does not apparently, in everyday life cause any very obvious harm, and yet in the light of all modern research there is a definite action against rather than for the individual. It is such a thought as this that makes some of us hesitate to accept even the cautious findings of the Medical Research Committee upon the physiological harmlessness of strictly discontinuous diluted alcohol with meals. In any case, without claiming too much against moderate drinking, modern scientific research points to its danger rather than helpfulness in life.

In this connection we are reminded of an article in the *British Medical Journal,* Sept. 18th, 1912, in which Dr. H. M. Vernon described some experiments he made with large doses of alcohol and says: "It might be thought that the physical changes produced in living tissues by these high concentrations of alcohols can have but little in common with those produced by the very much smaller narcotizing concentrations, but there is evidence which suggests that the difference may be only of degree." We have touched on the subject of calcium. According to Cloetta and Thorman (*Archives of Experimental Pathology and Pharmacology,* No. 103, 1924), alcohol narcosis causes a fall in the calcium content of the blood of from 3 to 15 per cent. This throws light upon other work. For example, Arkins in the *Journal of Infectious Diseases,* fifteen years ago, pointed out that calcium has a distinctly stimulating effect on phagocytosis. Then again, Lord Dawson of Penn, the late Professor Starling, and others have emphasized that alcohol is not good for muscular or mental work. Muscular activity and the recovery from fatigue is vitally dependent upon calcium. As Dr. Lovat Evans says in *Recent Advances in Physiology,* during muscular activity the reconversion of lactic acid is hastened by the presence of calcium ions.

During muscular activity, contraction, and relaxation, glycogen is oxidized, lactic acid is formed, and then the lactic acid is reconverted into glycogen. This remarkable chemical process is largely dependent on the right proportion of calcium. It will be recognized at once that here is a fundamental physiological reason for the fact that athletes who want to be at their best do not use alcohol.

Along another line, Dr. Ley, of Brussels, is one of those who emphasize that in epilepsy, before an attack the blood plasma is found to be deficient in calcium, hence one of the

reasons why alcohol is so strongly contra-indicated in all forms of epilepsy. It also lends strength to the statement of Dr. Muskens, that even one bout of indulgence in alcohol may induce an epileptic seizure. It has also been noted that a deficiency of calcium is observed in whooping-cough, debility of children, and in many other conditions. The fundamental importance of calcium was stressed by Dr. Orr at the British Association Meeting (1925).

All these strands of evidence, small in themselves, but gathering momentum as they converge, show on the one hand the subtle action of alcohol in its interference with photoplasmic activity, which is, as Dr. Orr said, "in a real sense regulated by the action of mineral elements in the solution in the protoplasm or attached to its colloids." On the other hand, it is these finer actions of alcohol which will demand closer attention from our physiologists and others in assessing the value or otherwise of alcohol even in moderation. A discussion of the part played by calcium is to be found in the *British Medical Journal,* Oct. 29th, 1927, and notes on the subject in subsequent issues. Dr. Oscar Lowe, of Munich, whose biochemical work is so well known, in a recent letter to me (July 4th, 1928), said: "An amount of alcohol that will interefere with normal nervous activity, an amount that will produce inebriety even in a very slight form, can disturb the balance of calcium. With the concentrated alcoholic drinks, such as whisky or brandy, it is difficult to say which amount will interfere with the balance of calcium; even a moderate dose of whisky may depress the appetite and thus the intake of calcium. The losses, even the normal ones, may thus be larger than the intake." The more we recognize the interaction between colloids and the salts in the blood, the clearer shall we see that the tendency of alcoholic indulgence is always away from rather than towards health. In so far as alcohol in any way interferes

with the normal integrity and balance of the blood, it is sapping and undermining Nature's first line of both defence and offence against infective and other diseases."*

The Heart and Circulation

Twenty-five years ago in the *Medical Temperance Review* Drs. Munro and Findlay wrote: "It has yet to be proved that the heart muscle can be stimulated by alcohol." Since then much very fine work on the heart has been done by Dixon, Starling, Sulzer, and others. The result is, we can now state on the basis of an ever-widening knowledge, that there is no evidence of any stimulation of the heart directly by alcohol, but always the reverse.

(*a*) There is Sulzer's work (*Heart,* vol. xi., No. 2, 1924) on 'The Influence of Alcohol on the Isolated Mammalian Heart,' and referred to by Starling in the *Practitioner,* Alcohol Number, October, 1924.

Sulzer refers to past work, quoting Martin, Dixon, and others. The paper reveals the caution and care with which Sulzer (who was associated with the late Professor Starling) performed his experiments. After describing the conditions of his experiments, he says: "The action of alcohol must be tested on a heart which is performing a normal amount of work, and in which it is possible to keep all the factors which influence the work of the heart, viz. arterial resistance, the inflow of blood, temperature of the heart, and the rate of its beat, constant apart from any possible influence of alcohol. Accordingly, what is known to physiologists as a 'heart-lung' preparation was used, because "in such any increase in resistance it has to overcome causes increased diastolic and systolic volume in the ven-

* These words were written in August, 1928, and the whole subject of calcium appears in a new light in face of the bulletin concerning His Majesty the King on January 2nd, when Dr. Dodds was called in with regard to calcium treatment.

tricles, provided that the inflow is maintained. If alcohol is a stimulant, the addition of small quantities to the circulating blood, while all other mechanical conditions of the preparation are maintained constant, should cause a diminution of the volume of heart both in diastole and systole, as is said to be the case for strophanthus (a heart tonic) and vice versa."

As it was, the results showed invariably a rise in what is known as the cardiometer curve, indicating a dilatation of the ventricles. The increase in the volume of the heart is due to incomplete emptying at each systole (*i.e.*, during the pumping out of blood), and to an increased filling at each diastole (*i.e.*, when the ventricle fills preparatory to its next contraction). The dilatation can be observed with concentrations of alcohol below 0.1 per cent. Sulzer then makes the followign important statement, which we venture to place in italics: *"The condition of the heart under alcohol is therefore the same as occurs in fatigue, in so far that in both these circumstances it dilates more than an unaffected heart would do when performing the same amount of work. It is evident from this that the power of the heart to adapt itself to more work suffers under the influence of alcohol. I have obtained no evidence of any stimulating or improving effect of alcohol even in small doses on the heart muscle. As soon as any effect was observed at all it was in the direction of diminished functional capacity. My experience never showed anything which might be explained by an improvement of the heart's action."*

Sulzer refers to Martin's work (1889), mentioned in the last edition of *Alcohol and the Human Body,* as "a remarkable anticipation of the results of more recent work."

(*b*) A further confirmation occurred in some work by Bodo (*Journal of Physiology,* Feb. 10th, 1928). It was referred to in an editorial in the *British Medical Journal,* but, oddly, one of the most important practical points for

the medical practitioner and patient was not mentioned. Bodo was testing certain so-called heart tonics, among which was the tincture of digitalis (which contains about 90 per cent. alcohol). He was testing the physiological condition or fitness of the heart muscle fibre—its mechanical efficiency. At first he used, among other drugs, the tincture of digitalis, but since Sulzer's work had shown the effect of even small doses or concentrations of alcohol on the heart's action, he replaced the tincture with a fresh infusion (aqueous) of digitalis. He says, "the tonic effect produced in this way was more marked than with the alcoholic tincture. The volume of the heart decreased to normal." This is a striking illustration of the value of experiment and of the definite deleterious action of alcohol on heart muscle.

(*c*) These two pieces of evidence may be collated with what Leonard Hill wrote in 1900 (*Text-book of Physiology*, edited by [now] Sir E. Sharpey Schafer): "Besides chloroform, alcohol may be mentioned as another drug which, while it renders the systolic output incomplete, increases the liastolic pressure and the dilatation of the heart." It is such evidence as this which lies behind the words of the Alcohol Investigation Committee: "No scientific ground has been discovered for any claim made on behalf of alcohol to practical value as a direct heart stimulant in case of threatened failure of the beat. The popular idea that it is a stimulant proves on examination to be scientifically untenable." This position underlay the discussion of cardiac stimulants at the Royal Society of Medicine on Oct. 9th, when the subject was introduced by Professor Gunn (*British Medical Journal*, Oct. 20th, 1928).

The Blood Vessels and Circulation

Whilst alcohol fails to stimulate the heart and indeed causes or tends to cause dilatation, it also has a definitely

weakening action on the blood vessels. The familiar flushing of the face which so often accompanies alcoholic indulgence is due to its effect in causing slight vaso-motor disturbance. Normally the muscle fibres in the small blood vessels keep up what is called tone. When the nerves supplying these muscles are weakened or paralyzed, the muscles relax, lose their tone, and varying degrees of vaso-motor paralysis result. This leads to more or less chronic congestion of tissues and organs, to general loss of tone, and, at the same time, continuous taking of alcohol leads to other degenerative changes. It is recognized to-day that syphilis is a powerful co-operant factor with alcohol in the production of widespread degenerative changes in blood-vessel walls, and both are accelerated in their action by auto-intoxication and gastro-intestinal poisoning. The change produced is termed arterio-sclerosis. It is therefore interesting to note how arterio-sclerosis as a cause of death increases in those professions and occupations, which also show a high death rate from alcoholism. Alcoholic indulgence hinders the elimination of waste products from the body and tends to lead to a condition known as auto-intoxication, and these three factors are the evil triad upon which much of the arterio-sclerosis is based.

DEATH RATES PER 100,000 (20-65 YEARS) MALES

Class.	*Cirrhosis of Liver and Alcoholism.*	*Syphilis.*	*Arterio-Sclerosis*
All occupied and retired civilian males	29	75	57
Class I.	54	62	111
Class II.	61	74	69
Class III.	17	68	46
Class IV.	19	68	47
Class V.	27	108	72

The table on page 101 shows the relation between alcohol, syphilis, and arterio-sclerosis.

Note here again the comparative immunity of the great class of skilled workmen (Class III.) and the very heavy price paid by the upper and upper middle classes for their indulgence.

There are of course varying factors at work in the various classes and individual professions and occupations, and therefore any general statement must be made with caution. Still it is a remarkable fact that the occupations with a high arterio-sclerosis death rate do so often present a high death rate from syphilis and alcoholism, and vice versa.

The Registrar-General has not given a C.M.F. for arterio-sclerosis, and any attempt to draw detailed inferences from death rates per 100,000 for individual occupations is surrounded by difficulties. Partly because arterio-sclerosis is a cause of death at the latter end of life rather than in the earlier years, so that those occupations which allow of the greatest longevity would present more cases of arterio-sclerosis. Then, again, there has been a tendency of late to include many deaths from 'old age' into the arterio-sclerosis certification so there again the death rate is swelled. When we turn from these individual aspects and take a wider survey the general relation between these diseases is shown—as, for example, in America.

In nineteen States with a lower than average for alcoholism and cirrhosis the death rate per 100,000 from these was 6.2 and the arterio-sclerosis rate 14.6. In nineteen with a higher than average for alcoholism and cirrhosis the rate was 12.1 and the arterio-sclerosis rate 24.1—the average for registration area being 10.5 and 20.5 respectively (1925).

CHAPTER VII

THE CHILD AND RACIAL POISONS

LIFE as we know it passes in a continuous stream from generation to generation—the past, the present, and the future linked in one genetic chain. This chain or relationship between successive generations is heredity, and the physical basis of such continuity of life resides in what is termed the GERM-PLASM. The germ-plasm, the 'bearer of life,' is contained in the sex glands, the testicles (male) and ovaries (female), and, as Galton said, "the individual is the trustee of the germ cells."

From a very early period in the unborn babe's life, the cells which are destined to form the sex glands and sex cells are segregated, set on one side, and take little part in actual growth and development of the body. Then in the early adolescent period these cells mature or ripen, and with their maturation the boy or girl passes out of boyhood or maidenhood into the possibility of potential parenthood. It is this potentiality which constitutes one of the great trusteeships of life. Because the continuity and essential well-being of the race depends upon germ-plasm, the sex organs are naturally of profound significance, and although remarkably resistant in many ways, it is an accepted fact to-day that they can be damaged by certain substances and thus cause injury to the immediate and succeeding generations. In 1906 Dr. C. W. Saleeby termed these

substances Racial Poisons. The term has passed into current scientific language, and is applied to those substances which may not only damage the individual but the race as well. The three great racial poisons are lead, venereal diseases, and alcohol.

Lead

There is nothing to add to what has already been said and written in previous editions (Horsley and Sturge) by Sir Thomas Oliver and others, summed up in Sir Thomas Oliver's words: "Lead is a racial poison; it destroys the fœtus in utero directly, or it cuts short its stay in the womb by its action on uterine muscular fibres." The way in which alcohol reinforces the malign influence of lead poisoning is not contested.

The Venereal Diseases

The numbers damaged by lead poisoning are, however, a mere handful compared with the unnumbered thousands annually injured and slain before or after birth by the venereal diseases, gonorrhœa and syphilis.

In *The Scourges of To-day,* Dr. Burke says: "Gonorrhœa is an intensely powerful race poison; it is a preventer of life." As Dr. C. W. Saleeby said in the last edition: "Gonorrhœa acts by causing inflammation of the reproductive organs in one or both parents, frequently so severe that new life cannot originate from these organs. In this way it is a poison which tends to destroy the race outright by causing sterility."

Lieut.-Colonel Fremantle, M.P., M.D., says: "Gonorrhœa accounts for half the sterility in women, 70 per cent. of all cases of ophthalmia of the new-born, for blindness, incapacity for work and suffering without end. Venereal disease is responsible for over half the cases of blindness in the London County Council Schools for the Blind, where

education costs seven times that of a normal child" (*The Health of the Nation,* page 113).

In 1926 there were notified 5,896 cases of ophthalmia (disease of eyes) in new-born children (latest figures published, 1928). In 1927 there were 46,822 blind persons known and registered in England and Wales. Of this number 8,000 had become blind in their first year of life, and in addition there are known at least 7,000 who are partially blind. The largest proportion of the blind become so in the first year of life.

Before passing to consider the influence of alcohol alone or in combination with other conditions, we feel we ought to stress the disastrous effect of syphilis in the national life. It has with cancer, tuberculosis, and alcoholism been called one of the great scourges of life.

Some years ago the late Sir William Osler, M.D., made an attempt to estimate the loss of life through syphilis as a co-operant cause of death. He worked out certain figures on perhaps a somewhat conservative basis. Dr. Burke followed him for 1924, and we have worked along the same lines for 1926, and the figures work out thus: 1915, probably at least 59,883 deaths really due to syphilis, in 1924 60,335, and in 1926 60,040. These numbers are estimates and not official. Many people are surprised at their size, and some practitioners have doubted their accuracy, and say, "that thy see very few cases of syphilis." Dr. Burke puts it very cogently and somewhat caustically when he says: "What they really mean is that they 'diagnose' only two or three; they see many more but do not always recognize the disease when they see it." We might add, when they do see it, it does not always appear on the death certificate.

As the Registrar-General said in his 75th Annual Report: "The deaths tabulated as due to syphilis clearly afford no

measure of the absolute amount of mortality properly ascribed to this disease. This is inevitable under the present system by which the causes of death are certified, an open certificate being handed by the certifying practitioner to the relatives of the deceased, and subsequently included in a register open to inspection by any member of the public on payment of a small fee. The practitioner is obviously tempted, in fact almost obliged in many cases under this system, to avoid mention in the certificate of the syphilitic nature of the disease he is returning as the cause of death."

Some indication of the prevalence of venereal disease is given by the attendances of patients at the various V.D. clinics during 1927, as follows:

VENEREAL DISEASES

Country.	*Total Number found to be suffering from V.D.*	*Total found not to be suffering from V.D.*	*Cost.*
England and Wales	52,085	23,828	£363,335*
Scotland - - -	10,480	3,496	76,000
Ireland (N.) - -	2,956	1,857	7,101†

Over 94,000 individuals were at least in danger of having contracted disease.

In the *Decennial Supplement,* the following figures for syphilis and cirrhosis of the liver are given, for certain occupations having the lowest and highest comparative ratios for syphilis and cirrhosis. All occupied and retired

* Cost in year 1926-1927; figures for 1928 not available.

† If local authorities claimed their full 75 per cent. assistance from Government.

males 20-65 years being represented by 1,000. A number of occupations showed no deaths from syphilis at those ages. Hence:

Occupations.	*Syphils.*	*Cirrhosis of Liver.*
Lowest Groups.		
Ministers	85	531
Anglican Clergy	114	521
Iron Miners	140	313
Bank Officials	207	1,521
Railway Officials	214	406
Bus and Tram Conductors	247	0
Highest Groups.		
Brewers	4,808	8,000
Actors	4,649	4,646
Waiters	2,598	2,354
Costers	2,284	1,537
Bargemen	2,144	646
Barmen	2,137	5,833

These figures speak for themselves, but they do not tell the whole story, as we have seen. If we examine the mortality from syphilis in the various social classes we see the effect of syphilis as a cause of death more clearly.

Thus the C.M.F. for all diseases in Class I. is 812,942 in Class II., 951 Class III., 1,007 Class IV. and 1,258 Class V. Some of the occupations, however, in each of the classes are higher or lower than the average for their class. If these separate occupations are arranged in groups of increasing mortality, then we find that the percentage of all deaths due to syphilis increases almost regularly.

EFFECT OF SYPHILIS ON MORTALITY

Social Class and Average C.M.F.	*C.M.F.* 500-700.	*C.M.F.* 700-900.	*C.M.F.* 901-1,200	*C.M.F.* 1,201-1,250.	*C.M.F.* 1,500
Class I. (812)	0.86	2.2	2.7	—	—
Class II. (942) -	0.98	2.2	3.9	—	—
Class III. (951) -	1.9	2.2	2.4	2.5	—
Class IV. (1,007) -	1.4	2.5	2.4	3.1	—
Class V. (1,258) -	—	—	2.5	4.0	3.5

These figures are to be interpreted thus: the C.M.F. for, say, Class II. is 942; in those occupations with a lower than average death rate for all causes, the percentage of all deaths due to syphilis is 0.98, 2.2, but in those with a higher than average mortality rate the syphilis percentage is 3.9. All the numbers are small, because of the comparatively small numbers dealt with, but they are very significant as an indication of the killing power of syphilis. Alcoholism bears a similar relation to a rising mortality.

The alliance between alcohol and syphilis has been contested, and more particularly as the result of a discussion started by Colonel Harrison (see *British Journal of Inebriety,* January, 1923). He referred to certain statistics compiled during the War, which showed that out of 1,256 patients questioned, 122 or 10 per cent. said they were drunk, 17 per cent. said 'jolly,' 47 per cent. said perfectly sober, and 24 per cent. said they were 'total abstainers,' at the time they contracted the disease. Speaking of these figures, Colonel Harrison said, "47 per cent. claimed to be sober, but I think myself that a claim to have been perfectly

sober does not exclude the influence of alcohol, since a man may be perfectly sober in his own estimation, though he has consumed an amount of alcohol which is rather over his customary dose. I am inclined to think that the sexual desire begins to increase where the customary dose is exceeded, and that it is in the lower ranges of alcoholism that there is active search for sexual gratification. I think that most specialists in venereal disease, would, if asked, give as their strong impression that the ruling circumstance which led to the contraction of venereal disease by quite a large proportion of their patients was a jollification in which rather more than the customary dose of alcohol was taken." He proceeded: "Our statistics as they stand do not make a strong indictment against alcohol as a factor in the contraction of venereal diseases. At the same time they do not vindicate alcohol, and I prefer to rely on my own impression, which agrees with those of almost all writers, in concluding that, other things being equal, if the consumption of alcohol ceased the incidence of venereal disease would be reduced."

He also dealt with the effect of alcoholism on the course of the disease, his impression being that total abstainers recover more quickly. In concluding a valuable paper, he said: "I think I am justified in believing that there is much in the saying, 'that if you want to preserve the germ of syphilis, do it in alcohol.' I advise my patients that the less alcohol they take the better, that generally speaking, abstainers are fitter than those who drink habitually, even though the daily amount is not considered to be large."

With the newer drugs now used in the active treatment of syphilis, abstention from alcohol is almost, if not entirely, recognized as a *sine qua non* of success.

Alcohol

The late Dr. Ballantyne once said: "Alcohol is a menace to child life at all stages of its existence, through either or both parents." In considering the effect of alcohol upon the child and as a racial poison, remember there are three stages in a child's existence. The Germinal Stage, the Fœtal, and the Post Natal.

The germinal stage runs back into the ancestral past, when the 'child that is to be' exists as a potentiality in the germ cells of parents and ancestors. The fœtal period is covered by those nine months during which, from conception to birth, the child is resident in the womb of the mother. The post-natal period is of course that which runs on from birth to adolescence and maturity.

Alcohol is a menace at all stages. Here, as so often, we utter the caution—We do not claim that strictly moderate drinking by a parent will of necessity so affect the germ-plasm as to damage the unborn child; but that, taking life as a whole, the prevailing extent of alcoholic indulgence is always a menace, and that in all cases excessive drinking, and in some cases even moderate drinking, may be the 'last straw which breaks the camel's back;' and that even moderate drinking for the expectant mother must be specially dangerous for the child (see later on the Placenta).

Alcohol as a Direct Racial Poison in the Germinal Period

Alcohol may poison the race through the germ-plasm in two ways, and these two ways must always be kept distinct.

First, it may do so through what Forel, Bertholet, and Mjoen have termed its Blastophthoric Action. By this they mean, that alcohol taken in excess, or freely and continuously, has the power of breaking through all the defen-

sive barriers and producing the most profound effect upon the sex glands and consequent interference with the sperm or germ cells. In such cases the alcohol causes degeneration of the protoplasm of the germ-plasm, interferes with what is called spermatogensis (that is to say, the formation of mature sperm cells), and if the germ-plasm is not actually destroyed, its architecture may be so interfered with as to cause imperfect offspring in the next, immediate generation, although the condition induced does not necessarily become hereditary and thus transmissible to successive generations. This blastophthoric effect of alcohol must always be kept clearly distinct from the second, the hereditary effect, because the former is absolutely clear and definite—the second is held by some to be debatable. We believe, after careful study of a good deal of relevant literature on the subject, that there is sufficient evidence not only for the former, but the latter, and hold that alcohol in excess is a definite racial poison inducing changes in the germplasm, which are transmissible to succeeding generations. [The question is discussed with caution from the eugenics point of view by Major Leonard Darwin in *The Need for Eugenic Reform,* and by Professor J. Arthur Thompson, in *Heredity,* both published by John Murray.]

Another point which must be borne in mind in all these discussions, is that the body has a wonderful resiliency and can recover from evil effects of a temporary character. Everyone knows that the body when injured makes a magnificent struggle towards recovery. Regeneration of tissue occurs. Similarly in matters of heredity, one of the most important factors in the conservation of the race is the power possessed by the body of restitution and regeneration. "Protoplasm always tends to return to right physiological lines" (Ballantyne). Suppose that, into a healthy stock, a physical strain of defect (resulting often

in a corresponding and collateral mental defect) should be introduced through marriage, nevertheless that stock, if conditions of life and habit are good, tends to regenerate or recover, and may eliminate the defect after a few generations. Then, too, always remember that generally speaking a defect in a parent, or an abnormal characteristic good or bad, always tends to be less marked in the offspring. It cuts both ways: a highly musical mother will probably have a less musical daughter, just as a highly vicious parent will probably have a less vicious offspring.

So we claim: (i) That alcohol can undoubtedly exercise a blastophthoric effect and injure not only the bearer or trustee of the germ cells, but also his or her immediate offspring.

(ii) That alcohol can so modify the germ cells that succeeding generations bear signs of degeneration, which they in turn may pass on.

(iii) That all life tends to regenerate, to get back to normal.

We can now proceed to discuss, necessarily briefly, some of the evidence on which these claims are based.

First, the Blastophthoric Action of Alcohol

Through the kindness of Dr. Bertholet of Lausanne I am allowed to reproduce some of his diagrams from his original monograph (*Petit Atlas-Manuel,* published 1913, Lausanne). He investigated the conditions post mortem in a large number of men and women of all ages dying from different causes, who were either abstainers or alcoholists of varying degrees. He found the most profound changes in internal organs, including the sex glands, and his work has been a most valuable contribution to our knowledge. He finds the sex glands are more sensitive to

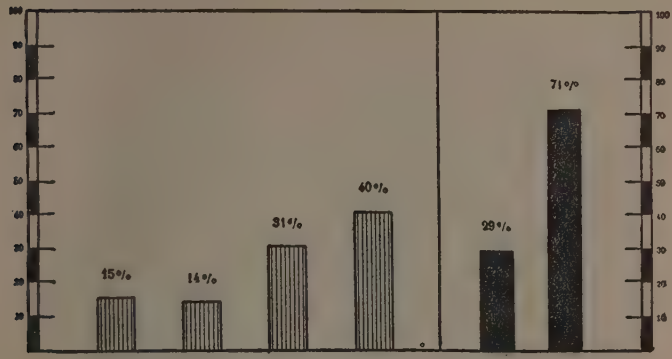

FIG. 2.—DIAGRAM SHOWING THE RESULT OF A MICROSCOPICAL EXAMINATION OF THE TESTICLE IN 100 CASES OF NON-ALCOHOLICS. THE FOUR CLASSES ARE ON THE LEFT AND THE TWO GROUPS ON THE RIGHT.

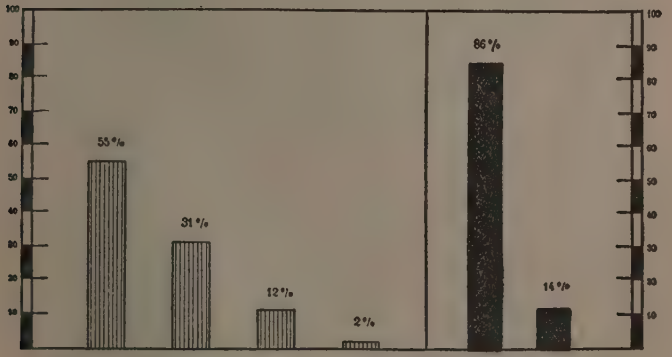

FIG. 3.—DIAGRAM SHOWING THE RESULT OF A MICROSCOPICAL EXAMINATION OF 163 CASES OF ALCOHOLICS. CLASSES AND GROUPS AS ABOVE.

the alcoholic intoxication than other organs. This work of Bertholet has been amply confirmed by that of others, including the original of Forel—who first used the term blastophthoria—Weichselbaum, Kostich (*International Review against Alcoholism,* Nos. 3 and 4, 1922), Agnes

FIG. 4.—DIAGRAM OF SECTION OF TESTICLE OF A MAN AGED 28 WHO DIED SUDDENLY, RESULT OF AN ACCIDENT.

Bühlm, and others. Bertholet divided his cases into four classes: (*a*) those which showed extreme degeneration of sex glands with total absence of sperm cells; (*b*) those where, although the degeneration was severe, there were still some sperm cells; (*c*) those in which although there may have been some change, the germ cells were still numerous; and (*d*) those in which the organ was normal. He

then grouped classes (*a*) and (*b*) into group A, and (*c*) and (*d*) into group B. The diagrams show the results—in 163 alcoholics, 86 per cent. of the cases showed gross changes, whilst among 100 non-alcoholics 29 per cent. showed gross changes.

In the text of his paper, Dr. Bertholet meets and answers

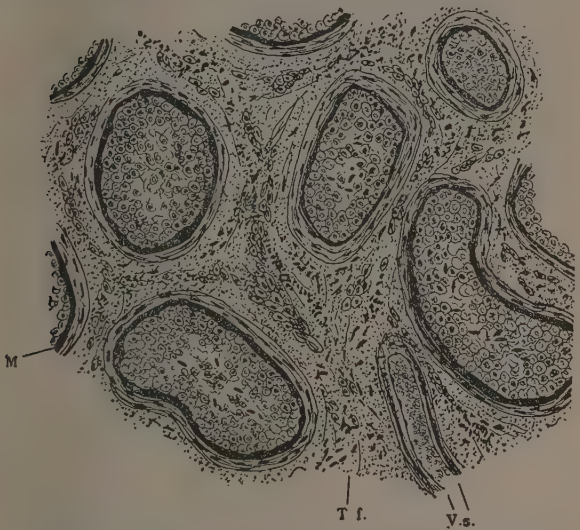

FIG. 5.—DIAGRAM OF SECTION OF TESTICLE OF A MAN AGED 36, A CHRONIC ALCOHOLIC, WHO COMMITTED SUICIDE.

a number of queries that may be raised, as to the effect of intercurrent disease as productive of these changes. He not only dealt with the naked eye appearances, but subjected many of the organs and tissues to microscopic examination. Fig. 4 is a representation of a section of the sex gland, the testicle of a man aged 28 years who died suddenly due to accident. The letters refer to the French

terms in which the Doctor described the conditions. TF=connective tissue, SP=sperm cells, the sharp needle-like projections into the canals through which the seminal fluid bearing the sperm cells (with their germ-plasm) passes. These for our purpose are the essential points—little connective tissue, many active sperm cells.

Fig. 5 represents the section from a man aged 36, who was a chronic alcoholic and committed suicide. Note the changes. The sperm cells are almost non-existent the cells lining the canals are degenerated and atrophied. The changes preparatory to the formation of new sperm cells are in abeyance. The membrane round the canals (*c*) is much thickened, and there is a great overgrowth of connective tissue tending to encroach upon the essential cells.

The conditions here depicted constitute blastophthoria—a physical wrecking of the very basis of new life, and, quite obviously, such a condition could not fail to have a profound effect on offspring conceived after such a condition was set up.

The Alcohol Investigation Committee, *Alcohol, its Action on the Human Organism,* in the second edition, May, 1925 (*N.B.*—The revisions are very important, and all workers should have the revised edition), say: "The state of the reproductive glands in habitual drunkards has been investigated by two independent observers (we might add three, including Kostich, C. C. W.), Bertholet, and Weichselbaum, who have shown that a condition of wasting of the testicles, with absence of scanty production of the fertilizing cells or spermatozoa is to be found in the majority of male alcoholics dying in the prime of life, while in the female alterations of a similar character may be found in the ovaries. Further it has been shown by experiments on rabbits that, by the continued administration

of the drug, morbid changes can be produced in the benital glands of these animals of the same type as those which have been observed in chronic alcoholism in human beings."

This represents, then, part of the evidence as to the blastophthoric action of alcohol, as a menace to child life in the germinal stage.

Secondly, the Hereditary Effect of Alcohol

A great deal of work has been done, and much evidence has accumulated, which varies in value and to a certain extent in results. We say value, because a good deal of the earlier work was done with massive doses of alcohol all out of proportion to the amount used in real life, even by an excessive drinker, and because insufficient care was taken to ensure adequate controls for comparison; in results, because a few observers claim only very slight results where animals of different kinds had been subjected to alcohol in one way or another. Many of the results, which on the surface do or do not incriminate alcohol, do not seem to me, at any rate, to have been conducted with that scientific caution and care which the subject demands, and so we shall not discuss them here.

There are, however, two pieces of work which demand attention, viz. Stockard's and Pearl's. They are not strictly comparable, since Stockard worked with guinea-pigs, which physiologically have a reproductive system similar to that of humans. Pearl worked with fowls, where reproduction is along different lines. However, both sets of experiments show the action of alcohol on germ-plasm—which is the main thing.

The work of Laitinen, Hodge, McDowell, Arlitt, and Wells and many others is all of value from one angle or

another; but Stockard's work has gone on for so many years, has been so thoroughly controlled and so cautiously stated and interpreted, that we use it as the basis of evidence that alcohol can induce a change in the germ-plasm of mammals of such a nature that it affects even the third generation. A full description of Stockard's work will be found in the *British Medical Journal,* 1922, vol. ii., and in the *American Journal of Medical Science,* 1924, etc. The work has been continued for many years. Recognizing that the sex glands and germ cells in guinea-pigs are placed in the body in similar positions and protected against adverse surroundings as in man, and that there is the same type of placental action, he gave his animals alcohol by inhalation to the point of intoxication six days a week. He did not give the alcohol by mouth, because its effect on the body is more severe, and he thought that these secondary effects might react on the sex glands. When the alcohol was inhaled it passed into the blood stream and thence was carried to, among other organs, the sex glands. The animals, he says, did not seem any the worse for this treatment, yet in spite of the fact that no deleterious effect on their bodies was discernible, their germ cells were definitely and adversely affected. This is a very significant fact.

Up to 1924 the control animals numbered 506 and sustained a normal mortality of 22 per cent. (under three months, when the guinea-pig reaches maturity); the alcoholized animals and their progeny numbered 1,197 animals and had a mortality of 38 per cent, over the whole series of experiments.

In the table there is an epitome of years of careful and laborious investigation, so far as the original animals were concerned.

	Matings of 35 Normal Males alternatively with		*Matings of 44 Normal Females alternatively with*	
	Normal F.	*Treated F.*	*Normal M.*	*Treated M.*
No. of Matings - -	81	81	77	81
Total Offspring - -	196	185	195	182
Failure to conceive -	6	6	3	10
Lived over 3 Months -	151	105	161	118
	77.0%	56.6%	82.5%	64.8%
Died under 3 Months -	45	80	34	64
Defective - - -	0	11	0	0

Here is the first established fact, guinea-pigs, mammals with a reproductive system similar to human beings, treated by inhalation of alcohol, by means of which the blood was charged with alcohol were so affected that:

They gave birth to fewer offspring, among whom there was a heavier death rate and more defective animals than among the normals.

From these offspring, as a whole, further breeding was carried out with result:

(*a*) First generation (termed F_1) had 195 deaths compared with 100 in controls, 43 per cent. compared with 22 per cent. There was a much heavier pre-natal mortality among those with alcoholic ancestry. Stockard says: "Treating parents with alcohol increases pre-natal mortality 250 per cent. and post-natal mortality 25 per cent. as compared with controls."

(*b*) Second generation (F_2) had a mortality 1½ times that of controls.

(*c*) Third generation (F_3) had a mortality 40 per cent. higher than controls.

Thus so far as guinea-pigs are concerned, there are two clearly established facts: (i) a definite effect on the par-

ents, (ii) there was higher mortality among offspring unto the third generation.

But now in the fourth generation (F_4) there was a change. Remember the ancestors, the source of the stock, were alcoholized, then their offspring through three generations were kept under excellent environmental conditions, were given no alcohol, were mated with definitely normal stock, yet had a bad record as regards defectiveness and death. In the fourth generation, says Stockard, "the animals are superior in record to the controls, a point of actual significance." Such animals have a mortality after 3 months of 13 per cent. compared with 22 per cent. in the controls with no alcoholic ancestry.

Finally, he says: "The experiments show the hereditary transmission through several generations of conditions resulting from an artificially induced change in the germ cells of one generation by treatment with alcohol."

Dr. C. W. Saleeby, who visited Dr. Stockard's laboratory in 1919, says: "No one having seen the work could question its thoroughness and veracity." We have outlined the salient facts; but what were some of the results seen generation by generation during the experiments? We quote brief extracts only: "Alcoholic males mated to alcoholic females, fourteen matings, in ten cases no offspring, three still-born litters, one living offspring died in convulsions six days after birth." Yet the parents did not seem obviously the worse for their alcohol.

"Nine control matings (non-alcoholic) in same group of animals gave nine living litters—all survived, large, vigorous animals."

"The defects caused by the alcohol treatment seem to be largely confined to the central nervous system and organs of special sense; the eye presents in the various de-

scendants of alcoholized parents all degrees of degeneration, opaque cornea, cataract, etc."

"Among 186 full-term control young of the same original stock not one was deformed."

The other work is that of Pearl, who treated not guinea-pigs but fowls by inhalation. His work has been published in book form in this country, in *Alcohol and Longevity* (Knopf & Co., 12s. 6d). Pearl devotes a good deal of space to a very miscellaneous series of experiments by various observers with results in different directions. Personally, having read carefully many of the original papers, one feels that the verdict 'not proven,' either for or against alcohol, must be written over them. Pearl's own work is of a different order, and although we differ from him profoundly in much of his writing, we have to recognize the care and caution with which his own work on fowls is tabulated and recorded. The present writer has outlined the results of Pearl in a paper, 'The Experimental Modification of the Germ Cells,' in the *British Journal of Inebriety,* to which the late Dr. Ballantyne cordially referred at Glasgow in 1922.

Pearl, in *Alcohol and Longevity,* sums up a good deal of discussion of his own and Stockard's and others' work thus:

"The racial effect of alcohol is preponderantly either beneficial or at its worst not harmful. This beneficial effect appears to be due to the fact that alcohol acts as a definite but not too drastic selective agent, eliminating the weak and leaving the strong. The only racial effects of alcohol which can possibly be regarded as harmful which have yet been brought to light by a mass of work are:

(i) The production of defective offspring in early generations by alcoholized guinea-pigs. Not confirmed by Pictet's work.

(ii) A possible slight reduction in activity and ability to learn of the offspring of alcoholized white rats.

(iii) A reduction in fertility following the administration of alcohol."

How far Pearl has succeeded in realizing the far-reaching results of Stockard we must leave to those who read carefully and fully all their work. One thing is very certain. Stockard's continued work, in spite of all criticism, has had a very profound effect on the members of the Alcohol Investigation Committee. In their earlier edition (*Alcohol, its Action on the Human Organism*) they were very half-heartedly cautious, and obviously unconvinced. In their last edition, however, there is a most deliberate, definite, and decisive expression of opinion. The passage in question is so important that we print in full:

"It has been shown by Stockard in a series of experiments that the offspring of alcoholized animals, in comparison with the young of control animals of the same stock, were conspicuously inferior in strength and vitality, and in many instances presented gross abnormalities of organization. These bad effects were transmitted through several generations, and were indeed more pronounced in the later generations than in the immediate offspring of the alcoholized parents. An important point brought out by Stockard is that the injurious influence of the intoxication may be present in the offspring even when the genital glands appear to be quite healthy, thus showing that, although there are no visible structural changes in the germ cells, they have been modified to an extent sufficient to cause them to give rise to defective embryos, which either die at an early stage of development and are absorbed, or, if they survive till birth, are weak, often deformed, and die before they reach maturity.

"These patient and carefully-controlled experiments of

Stockard have now for some years been available for criticism, and their soundness has not been called seriously into question. In their bearing on the results of parental alcoholism for the immediate offspring their significance is clear: persistent alcoholic excess, whether in father or mother, diminishes fecundity and increases the liability to still-births and to the production of weakly and defective offspring. It seems further beyond doubt that this influence of alcohol on germ-plasm is transmitted by heredity to further generations not exposed to alcohol."

In spite of this very emphatic declaration, it may be answered that Stockard and Pearl claim that the result of alcohol is a selective one. That it kills off the weaker specimens, and that the ultimate result of the adverse conditions created by alcohol, and subsequently transmitted by heredity, is to produce by natural selection a more robust and efficient stock than that maintained without alcohol.

To which we reply, first, that neither Stockard's nor Pearl's work reveals the result of a 'natural' selection. They both controlled the environment, and Stockard says it was kept as perfect as possible. In Pearl's latest work, he says he purposely made the environment as bad as possible, but he does not, and it is a vastly important matter, tell us how. However, in Stockard's case the environment was controlled; a drunken parent could not debase the 'home' conditions, because Stockard controlled them. In the case of human alcoholism, it is just this lack of control which co-operates in the production of ill effects.

Secondly, they both controlled the 'mating;' fresh strains of life, either good or bad, were kept out of the genetic programme. In human life, again, it is not so; marrying and giving in marriage is a much more promiscuous affair, and in many cases profoundly dysgenic.

Thirdly, the offspring unto the fourth generation, al-

though coming from alcoholized ancestors, were themselves forced to be total abstainers. Alcohol never came into the picture after the great-great-grandparents had induced the initial damage.

Fourthly, there is practical proof of how under these conditions the bad strain worked itself out, the protoplasm tended to return to right physiological lines, and did so.

Consequently Stockard's plea for alcohol as a possible means of improving a race (except under similar experimental procedure) falls to the ground. Not only so, but both Stockard and Pearl make the very strong assumption that the alcohol in the ancestors selected the weak germ cells: of that they have no proof; it is only assumption. The assumption and the larger claim have been quoted freely, whilst the facts of degeneracy have been rather neglected. No; we must remember that if alcohol kills some weak germs, it can also weaken strong ones. It is a weed producer as much as it is a weed killer.

Again, we quote in support from the Committee (p. 113, *Alcohol, its Action,* etc.):

"Stockard himself, from his later observations on his race of guinea-pigs, concludes that the ultimate result of his adverse influences, originally created by alcohol and subsequently transmitted by heredity, is to produce by natural selection a more robust and efficient stock than that maintained without alcohol. It is legitimate to doubt whether natural selection would produce this effect so clearly in the increasingly complicated conditions of civilized human society. Further, lest any should find in these results and conclusions an argument for palliating alcoholic excess, and should urge that sobriety may be good for us and our immediate successors, but bad for our race in the long run, it should be pointed out that the same argument would favour the abandonment by mankind of efforts

to protect the race from many other adverse influences. The only practical conclusion which the eugenist can draw from Stockard's experiments is the danger which excess of the greatest moderation in alcohol entails for the offspring, and even for their descendants for several generations, until the less resistant types have been eliminated by natural selection, or the effect obscured by crossing with healthy stock."

Let us at this stage summarize our position so far:

(*a*) There are *three great racial poisons,* lead, venereal diseases, and alcohol; and in actual life there is not only the direct result of each, but the result of their alliance and co-operation.

(*b*) *Alcohol may act upon the germ-plasm of the individual,* producing a blastophthoric effect, manifesting itself in possible signs of degeneracy in the immediate offspring, or it may produce a more specific change which is transmitted even to the third generation.

In animal experimentation, with adequate control of environment and mating, if further alcohol be withheld, then the initial damage is recovered from after three generations, and the fourth may be even stronger than the original stock. Thus we claim that **alcohol is a menace to child life in the germinal period.**

After the conception of a new life, it is implanted within the womb of the mother and for nine months undergoes its growth and development until birth. Coincidently with the conception and growth of the unborn infant, there is formed in the womb of the mother a most remarkable organ called the PLACENTA, or, as it is popularly termed, the 'after-birth,' since it is passed from the maternal body after the baby's birth. The placenta is a wonderful structure interposed between mother and child. It is a temporary organ designed to permit the exchange of natural and ap-

propriate gases and nutriment, and waste products, between the blood of the mother and the unborn child or fœtus (hence the fœtal stage). This exchange is effected without the two bloods, *i.e.*, mother's and child's, actually mingling. If the reader will place his two hands together so that the fingers of the right and left hands lie between each other, he will get a rough idea of the arrangement. Let the right hand represent the maternal side; then blood circulates through the fingers as a part of the mother's circulation. Now slip the left hand fingers in between the right; these may represent the fœtal side, and blood from the fœtus circulates through the fingers as a part of the child's circulation. Then without actual contact of blood stream, for the two circulations are really distinct, nutriment, etc., passes from the mother's blood across the space to the child's blood, and waste products from the child's blood to the mother's, whence the mother eliminates them through her own body. Thus the placenta becomes the organ or means whereby the fœtus, shut off from the outside world, receives nourishment, fresh air, oxygen, and is enabled to get rid of its own waste products.

The placenta has the power of keeping certain poisons from the child, but the three great racial poisons, lead, syphilis, and alcohol, among other things, can pass from the maternal into the child's blood. Alcohol is exceedingly diffusible and can readily pass from one part of the body to another. Indeed, if alcohol is taken by the mouth, it can very soon be detected in absolutely every fluid and tissue of the body. Not only is alcohol thus diffusible, but it is always tending to break down the natural barriers which nature interposes between health and disease, life and death, and in this case, the natural barrier between the mother and child. In a recent lecture, 'The Case for the Unborn Child,' Dr. Watts Eden refers to this diffusibility

of alcohol, this readiness to pass out of the blood into all the tissues, and the readiness with which it passes through the placenta. Then we know, too, from the classical work of Mellanby, that alcohol is very slowly oxidized or otherwise got rid of by the body. So that when a mother 'expecting a child' takes alcohol regularly, her blood is rarely free of alcohol; at any rate it remains some hours after even one dose (3½ hours for the equivalent of a pint of stout), and while in her blood it is constantly diffusing into the child's blood. Hence Dr. Eden says: "I do not think it can be disputed that alcohol drunk by the mother will pass into the fœtal circulation, that it will be present at any given moment in approximately the same degree of concentration in both mother and child, and that the child will be subject to its influence for a comparatively long time owing to the tardiness of its disappearance from the tissues."

Surely there are few facts of science of more vital importance to young womanhood than this, and few facts which throw a greater light on some of the cases of inefficient babyhood and infantile mortality.

Whether 'moderate' drinking on the part of the mother will do any harm may possibly be disputed, all we can say is, that if (and Dr. Eden's statement has been fully confirmed by various American and Continental writers) at any moment the degree of concentration of alcohol in the child's blood is the same as that of the mother's blood, then on no conceivable theory can we imagine anything but harm to the growing tissues of an unborn child in the alcohol contained in even moderate doses of alcohol. A mother (expectant) takes a glass of stout containing sufficient alcohol to at any rate make her 'feel,' as she would say, the 'good' of it. Within ten minutes the alcohol begins to pass into her blood and to the placenta, and for one hour it

passes rapidly in the same way; but—it has also passed into the blood of her child; indeed, the mother who drinks when carrying a child is veritably and indeed giving her child alcohol. It may be said, Yes, but the mother also takes beef-steaks and other things you would not give an infant. What about it? The answer is simple and direct. The beef-steak, consisting of fat and protein, is profoundly altered by digestion, the fat is chemically changed, and the protein is split up into its constituent elements (technically termed amino-acids), and these are absorbed by different tissues according to their varying needs, but alcohol absolutely unchanged passes into the blood and remains in the blood, till oxidized, as alcohol. The two processes are absolutely different. Then again, beef-steak contains essential foodstuffs, fat and protein. Alcohol is never essential to any healthy human body. (See also *Problems of Population and Parenthood,* 2nd Report of National Birth-Rate Commission. Published by Chapman & Hall, 1920.) Thus **alcohol is a menace to child life in the fœtal period.**

Finally, we come to the last stage, the POST-NATAL, *i.e.* the period after the child's birth. Here of course everything that impinges upon or affects the life and environment of the child may be, and repeatedly is, adversely influenced by alcohol in all degrees of its indulgence by parents: in what manner will be clear as we proceed.

In a general way there is a steadily increasing realization in all parts of the world that alcohol is bad for young life. Thus Kassowitz, from his large experience of children's diseases in Berlin, directly attributes many of the cases of loss of appetite and digestive failure to the small amounts of light wines given to children at meal times. Many of these wines are astringent and constipating, and by no means such simple drinks as they are supposed to be.

Organs and tissues injured in early life probably never reach their perfect development, and in adult life, in consequence of such injury, the individual exhibits neither the full physique nor normal longevity of his race. As Sir Thomas Barlow says: "We have many examples of the experience that when a morbid process is started in a child, it seems at times to run riot in a way unparalleled in adult pathology. Sometimes morbid growths grow with the child's growth, and the child may grow into its disease instead of growing out of it. . . . In several cases in which alcohol was given in childhood, the craving induced became a very decided and lamentable feature." ('The Use of Gin in Infantile Disorders,' National Temperance League reprints.) Here Sir Thomas confirms what he said in giving evidence before the Departmental Committee on physical deterioration in 1903, where among other things he said: "The occasional administrations of gin to children for flatulence is very common amongst certain classes of the London poor. The production of fibroid changes, or, in other words, the hardening and toughening of certain of the viscera of a child during the period of development, may be very far-reaching in its ultimate effects."

And yet, in spite of it, and in spite of all the convergent testimony of modern science, Sir William Arbuthnot Lane, who has constituted himself a champion of dietetics and new health, has in a popular lecture publicly advised the putting of a few drops of brandy in the baby's bottle! Since the publicity of this retrograde advice and the consequent indignation of intelligent and educated laity, Sir William has stated in a letter that what he meant was that in his earlier days he had found alcohol useful in the treatment of children. Surely a very different proposition.

Prfoessor Demme, of Zurich, referring to the adverse

influence of alcohol given as an article of diet to children, has related his experience during an epidemic of diphtheria. Those who had previously been accustomed to the daily and ordinary dietetic use of alcohol showed themselves much less able to resist taking diphtheria, and succumbed to it in a greater proportion than did those children who had been brought up without it. This runs parallel with Rolleston's experience, already quoted, where there was a great reduction in the death rate when no alcohol was given in treatment. We worked out the comparative death rate in nearly 50 fever hospitals, from diphtheria, and found that there was a much higher death rate in those which had used the greater amount of alcohol. But, unfortunately, there was no means of adequately testing the severity of the epidemic in various places, nor could one tell how soon the cases came under treatment, nor the class of community. Hence the figures even if quoted would have little real scientific value, but as far as they go they are suggestive, and suggest a question. Rolleston's death rate was 3.01 per cent., the national death rate from diphtheria was 5.86 per cent. in 1926 (*i.e.*, per cent. of cases notified). What would have been the national death rate on a similar line of treatment? In France, the detrimental effect of alcohol upon child life has recently been much to the fore. The French Academy of Medicine appointed a committee to investigate the increase of alcoholism. The *Bulletin* of the Academy, No. 20, May 18th, 1926, contains a full account. Among other things, drinking among children was referred to. Dr. Bose, of Tours, said: "The alcoholism of the country folk is appalling. Children commence to drink when they are weaned, sometimes before. The result is seen in the mental deficiency of the school children and other well-known signs of alcoholism." Bose and others drew a very dark picture, and the Report cautiously says: "The pic-

ture is perhaps a little too black, but it is unhappily true in its main features."

It has been estimated that France with a population of 41,500,000 consumes, at the very lowest computation, 27,257,000 proof gallons to Great Britain's 12,881,000; wine 915,000,000 gallons to Great Britain's 16,628,000; cider 160,000,000 to 10,000,000; beer 110,000,000 gallons to 943,000,000—a total alcohol consumption of 145,000,000 gallons compared with our 51,500,000; being 3½ gallons per head instead of 1¼. In addition it must be remembered that over 2½ million people have the right to manufacture for domestic use no less than 20 litres of brandy every year. There is an alcohol fact and a problem in France.

From France, turn to Italy, where again juvenile alcoholic indulgence is a practical problem. An investigation made in Milan in 1924 has been reported upon by Dr. Bajla, head of the Office of Hygiene of the commune of Milan. He says that in 1908 it was found that between the ages of 9-14 years 83 per cent. of the children were given wine with their meals, in 1924 the number was 61 per cent. Questions were sent to the schools asking what was the effect of alcohol so consumed. 14 per cent. of the masters gave no reply, 22.2 per cent. said scholarship was as good in drinkers as in non-drinkers, 21.5 per cent. that the non-drinkers were better. 14.3 per cent. said their best scholars drank hardly at all, whilst 27.4 per cent. said their best scholars were total abstainers. A similar investigation in the schools of Venice showed 25 per cent. abstainers, 75 per cent. drinkers, chiefly with meals. Dr. Bajla points out that much of the drinking was among poorer children, probably given to them under the impression that it could give strength and promote growth. The Ministry of Public Instruction has issued a note to the au-

thorities to find out as far as possible how far drinking on Saturday and Sunday affects the drinking children as compared with their abstinent comrades.

One of the more disastrous results of alcohol upon children centres of course on the nervous system. At birth the brain cells are immature, and growth proceeds until the twenty-fifth year of life more or less, and during that period the brain cells should absolutely and entirely be protected from alcohol.

We may remind readers that brain capacity and consequently mental efficiency depends upon the number, the development, and the durability of the brain cells and fibres. One of the germinal effects of alcoholism in the parent is to cause a diminution in either or all of these elements more or less, and after birth, until maturity is established, alcohol may be a very real menace. The full development of a child's brain is intimately connected with the thyroid gland (a gland on the front of the neck, which is enlarged in goitre) as was pointed out by Horsley and his pupil, Murray. Any interference with the thyroid may be the cause of varying degrees of mental defectiveness, and if extreme, producing the condition of cretinism. In one of the more recent text-books (*The Thyroid*, by André Crotti, New York, 1922), it says: "Infective diseases of the mother during pregnancy, tuberculosis and syphilis have been incriminated as causative factors in infantile thyroid atrophy. Alcoholism of the mother during pregnancy has been found, too, as a cause of thyroid insufficiency in childhood. We know that it has been experimentally demonstrated that alcohol has a damaging influence over the thyroid, consequently it is permissible to assume that in cases of severe alcoholism of the mother during pregnancy, the intoxication of the mother may damage the thyroid of the child in utero." Certainly it is easy to see how an unbal-

anced or weakened thyroid may be still further affected after birth.

Alcohol and Home Life

We need not refer at length to the drunkard's home, but there is one aspect worthy of note. It is being recognized to-day how easily the child mind may be seriously affected through mental shocks or trauma, as they are termed, in infancy and childhood. Fear operating upon a child's mind is a very potent factor in hindering the fullest development and freedom. Who can measure the effect that fear produced by an intoxicated or quarrelsome parent may have upon a child. There are to-day in our nation scores of children, in all classes, who have grown into adult life, who bear and will bear the results of impressions made during infancy and childhood by noisy, violent, alcoholic parents. There are others who are paying for loss of sleep in some form of neurosis or epilepsy. Hence one of the national gains from the earlier closing of public-houses, the curtailment of evening drunkenness and the necessarily quieter homes—a very real gain not always recognized when hours of closing are debated.

The effect of alcohol on the home life of the child has been emphasized by Cyril Burt (*British Journal of Medical Psychology,* vol. iii., 1923). He was dealing with juvenile delinquency and, after speaking of the practically equal effect of intrinsic or psychological and extrinsic or environmental conditions, recognizes the vast importance of home influences, where "material conditions such as poverty are far less important than moral conditions, such as ill-discipline and vice." Among the powerful factors making for juvenile delinquency he puts the 'vicious home' in a prominent position. The features of a vicious home are seen in the next table. Burt investigated an equal

number of children from similar homes; half these children were juvenile delinquents, and he found that the different factors occurred as shown.

THE VICIOUS HOME AND ITS INFLUENCE ON JUVENILE DELINQUENCY

	Delinquents.	*Non-Delinquents.*
Overcrowding	17.7	13.7
Sex Immorality at Home	4.6	0.2
Irregular Union	6.1	0.7
Drunkenness	8.1	3.0
Quarrelling	6.6	0.7
Neglect	4.6	3.7

The intercurrent and co-operating agency of 'drink' will be only too apparent. Burt says: "Of all the features of the vicious home the commonest and most remarked is drunkenness; . . . for the impressionable years of childhood a drunkard's home is one of the worst conceivable."

The Economic Side of Home Life

Many of the factors here come within the circle of everyday teaching. 'Less beer, more boots,' 'Less beer, more milk,' with all that they imply, are two well-known slogans. Much of the money spent, even on the most moderate use of alcohol, does mean that essentials are reduced more than they need be. Why is milk so essential to child life? The Annual Report (1927) on the state of the public health gives a part of the answer.* In many diets to-day there is a lack of vitamin D and of calcium—vitamin D is essential for the proper utilization of calcium (see also page 94).

* Confirmed by the work of Dr. Cory Mann, *Special Report Series* 105, and the recent report from Scotland, see *British Medical Journal*, January 5th, 1929.

The Chief Medical Officer says: "In diets where cereals bulk largely, the effective calcium content of the diet would be still further reduced. All these defects can be readily corrected by the addition of milk and green vegetables, which has earned for these two foods the term 'protective foods.' The great value of milk lies in its fat as one of the carriers of the vitamin D.

Dr. Cramer (*Lancet,* Oct., 1927) stated that the desirable butter fat consumption would be 2 oz. per day per head—we actually consume 0.56 oz.; allowing for the milk, cheese, etc., consumed, we are probably consuming in Great Britain 300,000 tons of butter fat less than we should. We need to double the milk production and consumption. And yet, whilst this country spends £170,000,000 on alcohol (allowance made for taxation), the greatest single enemy of child life, we spend £70,000,000 on milk, one of the great 'protectors' of life. (The drink bill for Great Britain, £298,800,000.)

In the matter of milk for the child, *alcohol stands doubly condemned.* First, *it can only too easily rob the infant of its intrinsic birth-right,* viz. a plentiful supply of its own mother's milk. Dr. Bunge long ago pointed out how often the daughters of alcoholic fathers were unable to nurse their babies, and to-day it is being increasingly realized that alcohol taken by a nursing mother is only too often a hindrance to successful lactation.

The whole subject of lactation, the ability of the mother to suckle her offspring, is fully discussed in the Birth Rate Commission Report. There is no doubt that if a nursing mother drinks heavily, alcohol will be found in the secretion from her breasts; but apart from such excess, there seems little doubt that the milk of an alcoholic mother may damage the child. It would be an interesting piece of research work in some big welfare centres if a careful and

well-controlled series of investigations could be made on the 'quality' of maternal milk with and without alcohol. The vast importance of breast feeding cannot be over-estimated, and anything which even remotely affects the ability of the mother to nurse her child, or the quality of her milk, is to be considered not merely an individual but a national concern.

The importance of breast feeding is borne out by the remarkable figures given by Dr. Beard, of Carlisle, in his last Annual Report (1928).

DEATH RATES PER 1,000 BIRTHS AMONG INFANTS UNDER 1 YEAR

Mode of Feeding, etc.	1918.	1927.	*Sixteen Year's Record*		
			Total No. of Infants.	*Total Deaths.*	*Death Rates.*
Total Infant Mortality	126.8	68.4	18,588	1,871	100.6
Mortality, Breast-fed	49.6	36.5	14,420	639	44.3
Mortality, Breast- and Bottle-fed - -	122.2	127.6	1,131	244	215.7
Mortality, Bottle-fed	520.4	126.8	1,977	581	293.8

In view of these figures, note what Dr. C. J. Nepean Longridge, M.D., Examiner to the Central Midwives' Board, says: "Has alcohol in any form any direct stimulating action on breast tissue? The answer must be given in the negative. Does alcohol hold a preferential position as a substance out of which the breast can manufacture milk? Another negative must be given. What then, if any, is the use of alcohol? It has absolutely no direct use."

But some mother may say: 'I have a greater quantity of milk when I take alcohol.' True, but quantity is one thing, quality quite another, and it is the quality which

suffers. Alcohol does cause a flushing of the breasts with a watery secretion, much as it produces a watery gastric juice. Milk would be infinitely preferable for the nursing mother. Many women say that milk disagrees with them; it is probably more an excuse than a reason, and is helped for many by their ignorance as to the true value of alcoholic beverages.

The specious advertisements of nourishing stouts blind the eyes of many as to true nourishing values of stout and milk. The following is an analysis made for the Midland Temperance League by Messrs. Southal Bros. & Barclay.

	Stout.	*Milk.*
	Per Cent.	*Per Cent.*
Proteins - -	0.52	3.2
Carbohydrates	5.38	5.1
Colouring Matter - -	0.23	Traces
Mineral Matter	0.26	0.7
Fat - -	Nil	3.5
Alcohol - -	5.7	0.0

Money spent on milk would help to protect both mother and child.

Under present economic conditions, the amount spent upon alcohol in many classes of the community is money which is needed for other amenities of life, and the sadness of it lies here, that vast numbers of people even to-day spend money on drink, not merely as for a luxury they like, but because they do honestly believe that it is, if not a necessity, yet at least a valuable article of diet.

Social workers might read with advantage *The Report on the Nutrition of Miners and their Families,* Special Report Series, No. 87, H.M. Stationery Office, 1924, 1s., not for anything about alcohol, but for its economic facts.

Closely allied to other home conditions is the fact of infant mortality generally, and that due to SUFFOCATION OF INFANTS SPECIALLY.

In pre-war days, when the consumption of alcohol was so much heavier than to-day, the rise and fall of infant mortality with rise and fall in alcoholic consumption was marked, but now with the lessened consumption on the one hand, great regard for child life and the increase of welfare centres, the relationship is not so immediately obvious. At the same time, with the progressive reduction in alcoholic consumption there has been a progressive fall in infant mortality.

As with infant mortality, so with suffocation of infants. Broadly speaking, undoubtedly the deaths from this cause have fallen coincidently with the fall in alcoholic consumption. (Note the rise of both in 1920 although the rate per 1,000 births was lower.)

In the last edition (of Horsley and Sturge) Dr. Templeman was quoted, and the fact stated that in 1903-4, the mean annual number of deaths of children in London from overlaying was 612. In the greater London area, 1926, there were only 65 deaths, and in 1927 it was still further reduced to about 54 (0.74 per 1,000 in 73,263 births). Although we fully recognize the fact that since 1913 cases of suffocation have fallen from 1,226 to 392, and consumption of alcohol from 1.91 gallons per head to 1.25, the whole question needs careful statement.

The Registrar-General has drawn special attention to the subject from 1890 onwards. It was then pointed out that the highest proportion of deaths occurred on Saturday night, the rate per 1,000 births (England and Wales) being 1.74. By 1918 the rate had fallen to 0.84, and in 1927 it was 0.60.

In 1890, of every 1,000 deaths 283 were on Saturday

night (no other day had more than 137). In 1916, the Sunday (Saturday night) rate was 188. Dr. Stevenson says: "It will be prudent for the present not to assume that the whole of the decline in this form of infant mortality is due to increased sobriety, though the striking change in the weekly distribution of deaths suggests this as the most important cause." The whole question has been discussed by Dr. Brend (see *State of Public Health*, 1927, pages 26-27), and Sir George Newman says: "He has certainly provided evidence to justify considerable caution in the use of deaths from overlaying as an index of alcoholic intemperance." In this connection it is interesting to compare Great Britain and Ireland with the United States of America. The figures are from the mortality statistics (U. S. A.) and Registrars-General for Great Britain and Ireland.

United States (1924) (*Figures for 1926 not available*)		Great Britain and Ireland (1926) (*Lower in 1926 than in 1924*)	
Deaths under One Year.		*Deaths under One Year.*	
Cause of Death and Number.	*No. of Births.*	*Cause of Death and Number.*	*No. of Births.*
Lack of Care, 166 Mechanical Suffocation, 874	1,930,614	Lack of Care, 351 Mechanical Suffocation, 559	886,350
Rate per 1,000 Births, 0.5.		Rate per 1,000 Births, 1.0.	

If 'convulsions' be added to each total, since it is said many deaths ascribed to overlaying are really due to convulsions, then the figures for U. S. A. would be 1.3 per 1,000 and Great Britain and Ireland 3.8 per 1,000.

It is further interesting to note that in 1916 certain States in the registration area for births and deaths (U. S. A.) had 104 deaths from lack of care out of 818,983 births, and the same States had only 42 deaths in 1924 out of 828,146 births. (Note in reading U. S. A. statistics that death registration area and birth registration area is not the same. These figures are based on both areas calculated separately.) See Guy Hayler's article on 'Prohibition and Child Life,' in *Alliance Year Book,* 1927, for other pertinent facts.

Two great aims lie before us—those connected with eugenics and euthenics. The one seeks the best possible hereditary heritage for every child born into the world. The other seeks the best possible environment after the child is born, and indeed before it is born, for, remember, the environment of the unborn child is his or her potential parent's blood stream.

Alcoholic indulgence is one of the most powerful dysgenic factors at work in our national life, and, as we have tried to outline, is indeed a menace to the child at all stages of its existence.

CHAPTER VIII

ALCOHOL IN THE TROPICS AND IN THE SERVICES

THERE is little to add to the statements made in former editions under these two headings. Sir Leonard Rogers did not find it necessary to add to his concise statement, which should be read in conjunction with the latest which he wrote for the *Practitioner,* 1924, and published by the National Temperance League in their series of reprints.

The increased sobriety of the Indian Army has continued, and the latest figures are striking.

In 1887-1891 there were 3,625 admissions to hospitals in India for alcoholism, by 1907-1911 these had dropped to 299.

The Director-General, Army Medical Services, was, in August, 1928, unable to send the figures for India, but in 1926 (last year available), for the whole of the British Army at home and abroad, including India, there were 16.

Sir Leonard Rogers emphasized in his chapter the inutility of alcohol in treatment of many forms of tropical disease; his position was very fully confirmed by the actual practice in a large number of Indian hospitals, which we published in *Alcohol in Medical Practice.* As that book is now out of print we summarize the Indian figures.

The returns were received from the Surgeons-General with the Governments of Bengal, Central Provinces, Behar and Orissa, Bombay, Madras, Assam, Burma, and United

Provinces, consequently they are very representative of Indian practice:

(1) In every case save one a marked diminution in 1923 compared with earlier years.

(2) The average amount per head was definitely less than in the average British hospital at home.

(3) That even when medical superintendents added comments as to the value of alcohol, the actual practice showed how little was, in fact, used.

The Surgeon-General (Madras) said: "As a temporary stimulant the amount is getting less and less every year. This is only natural, since there are better stimulants available. Some patients like alcohol and think it does them good. This I believe to be one of the principal reasons why it is given to a good few cases."

Twenty-nine hospitals with 121,670 patients in residence during the year (1923) were given 117,360 ounces. The amounts are given very accurately in original returns. One superintendent "looks upon alcohol as a valuable stimulant in various acute illnesses," and yet he used only 97 ounces for 1,836 patients, or 0.005 ounce per head! Another thinks alcohol of decided value in exhausting diseases and yet used only about 1/10th of an ounce per patient on the average.

The Navy and Army

Under the Royal Army Temperance Association and the Royal Navy Temperance Society, much good work has yielded great results. In connection with the improved amenities of service life, increased facilities for sport and social life, etc., there has been a marked decrease in insobriety.

The work initiated by the late Dame Agnes Weston, with Dame Sophia Wintz, who carried it on until her death

in January, 1929, has had most remarkable and far-reaching results in every way. Some idea of the extent of the work may be gathered from the facts for 1927. Comfortable beds were provided for 245,956 naval men, not including those who slept on settees, couches, etc. Hot baths for 32,958. Eight full-sized billiard tables were used for 27,200 games. Nearly 7,000 visits were paid by workers to ships and hospitals, 6,600 new members were enrolled as total abstainers, and 399,000 parcels of woollens, etc., were sent out to the fleet. With the fullest co-operation of the admirals and officers commanding, a remarkable series of lectures on the scientific aspect of alcoholism have been given at Portsmouth, Plymouth, Shotley, etc. The Commodore, who presided over a vast gathering of officers and men, said last year: "Drinking as a cause of crime has practically disappeared compared with the years when I entered the service." One who has done a good deal of the lecturing was impressed again and again by the evidence of how well worth while Band of Hope and other juvenile work is in its influence on the resolution and behaviour of young bluejackets.

Some light on the effect of all this work is reflected in the interesting article in *The Times,* April 9th, 1928. The article states that rum is steadily losing its popularity. One-eighth of a pint is allowed to each man over 20 years of age. In *H.M.S. Nelson* there are 1,106 men on board eligible for the issue, but 731, or 66 per cent., draw their threepence instead. The consumption of tea is increasing, and during the ten minutes' 'stand easies' the men may be seen making their own particular brew. Boiling water is laid on to each living space in the ship, and no doubt this encourages the homely habit. Twenty-eight pounds a week is spent on 'soft drinks' at the soda fountain at 1d. a glass. Here, surely, is a logical result, not only of the

wisdom of the Admiralty in allowing the men the money in lieu of rum, and of the increased amenities of naval life, but also of all that devoted work of the late Dame Weston and of Dame Wintz, a work which earned for Dame Weston the title of "Mother of the Fleet."

In a Band of Hope competition, children were asked what they knew about certain persons, including Dame Agnes Weston, one child answered, "that Dame Weston was the mother of a large number of sailors and brought them up on milk."

CHAPTER IX

THE INFLUENCE OF ALCOHOLIC BEVERAGES ON NATIONAL LIFE

The Fact and its Effects

The great broad fact which the nation has to face is, that we consumed during 1927 in Great Britain 51,500,000 gallons of absolute alcohol in the form of beer, wines, cider, etc., and spirits. This is the fact, and although we are fully conscious that there has been a great decrease in alcoholic consumption in recent years and a consequent and collateral improvement in many directions, we are still face to face with a great and pressing problem arising from that fact. We believe that there is no other single factor which is militating against the realization of a progressive civilization and worthy citizenship like the effect of alcoholic indulgence.

In the House of Lords (June 30th, 1924) Lord Dawson of Penn said: "It is common ground that the consumption of alcohol in this country is far too great, and it is likewise common ground that the nation spends far too much on alcohol"; this categorical statement was repeated in 1927, when Lord Dawson recognized the value of Band of Hope teaching.

The President of the British Medical Association said: "There were five great scourges of national life, cancer, consumption, rickets, venereal disease, and alcoholism, and

that venereal disease and alcoholism were responsible for most of the misery and moral degradation."

In *Scourges of To-Day,* Dr. E. T. Burke introduces his subject thus: "Four grim horsemen constitute the scourges of modern civilization—venereal disease, cancer, tuberculosis, and alcoholism."

Lieut.-Colonel Fremantle, M.P., M.D., in *The Health of the Nation,* tells us "it is well to focus attention on the four scourges that ravage the health of the nation—tubercle, cancer, venereal disease, and alcoholism and other drugs."

Here, then, are four unofficial testimonies by men who are in no sense speaking as 'Temperance' advocates, who recognize that the consumption of alcohol constitutes a scourge which ravages the health of the nation. They would probably reply that they refer to the results of excessive use, or abuse, as they would say, of alcohol. But as we look at the whole body of evidence collected by the late Sir Victor Horsley and his colleagues, revised and to some extent brought up to date in this little book, who can say where use ends and abuse begins?

As a fact of national life we must look at the net result, which is the passing sensuous enjoyment of a few, and a widespread, interlocked, co-operating evil for the many.

We turn therefore to one comprehensive official utterance.

In 1919 the Right Hon. C. Addison, M.D., F.R.C.S., M.P., Minister of Health, instructed Sir George Newman to draw up a memorandum on some of the principal matters referring to the practice of preventive medicine. It was published under the title, *An Outline of the Practice of Preventive Medicine* (cmd. 363. H.M. Stationery Office). It had a most remarkable reception and in 1926 was out of print. On the instruction of the Right Hon. Neville Chamberlain, M.P., Sir George presented a new and enlarged revised text. We refer to this historical genesis and

confirmation because the whole document comes to us with the weightiest official backing. In the two editions we are given a concise survey of the damaged life of the nation, and suggestions for a national policy to remedy the state of affairs. We shall not quote at any length, because we think every social worker ought to be in possession of a copy of the pamphlet.

We are reminded of the ravages of cancer, rheumatism, and other diseases, and a number of figures are given. Thus we are told in this and other Government documents:

(*a*) *Children.* "That on a moderate computation not less than a million children of school age (not in school attendance) are so physically or mentally defective or diseased as to be unable to derive reasonable benefit from the ordinary form of education which the State provides."

(*b*) *Youth.* Out of 261,137 youths who became 18 years of age in 1918, there was found a deficit of 13,000 in Grade I. and an excess of 6,000 in Grade IV., "in other words almost double the number of youths totally and permanently unfit for any form of military service than there should have been." The Report of the Ministry of National Service said: "We may well be surprised that with human material of such physique, it was found possible to create the armies which overthrew the Germans, and proved invincible in every theatre of war. We cannot but feel that the spirit of the race which alone made this possible deserves that no effort should be spared to ameliorate the conditions which brought about such deplorable effects upon its health and physique."

(*c*) *Manhood.* During the last year of the War over 1,000,000 men who ought to have been in the prime of life were likewise found to be so physically unfit as to be unable to render any direct military service.

When we turn from these facts and figures to the pres-

ent, a number of points become clear. Among the one-third of the entire population which is insured in the national system there was lost, in 1927, through sickness and disability of one sort or another, a total of 30½ million weeks' work (586,540 years) at a total cost of nearly £18,000,000. Moreover, it is not only the loss of this time for which insurance was paid, but also the labour and expense entailed in the care of patients during their incapacitation.

There were in 1927, 484,609 deaths: 54,078 from cancer, over 31,000 from tuberculosis, 72,109 from heart disease, and over 70,000 from bronchitis and pneumonia. Having reviewed these and other corresponding figures for the year in which he wrote, Sir George recognizes, as all medical men do, that a great deal of the disease and death is preventible, and that the great problem is how to rear and maintain a healthy race. Passing over the broad lines of reform and coming to some 'elements of a national policy,' the first thing dealt with is hereditary and race. Under this heading Sir George deals first with alcoholism, then venereal disease, and thirdly feeble-mindedness—the great trinity of evil which is so interwoven into the very matrix of national life. "If," he says, "we are to grow a sound and healthy race of men, we must begin, where all true breeding begins, at the source. If we permit ourselves to favour and provide for the unguided propagation of a population of poor physique, or of persons marked from birth with the stigmata of alcohol, venereal disease or mental deficiency, we shall sooner or later discover that we are building on false foundations, without taking sufficiently into our reckoning the laws of heredity, of transmission, and of antenatal infection." The excessive consumption of alcohol in one form or another has exerted its baneful effect upon the human race for many centuries. Its modes of action are various. It may affect the race by affecting vast

numbers of individuals with a greater or lesser degree of physical or mental degeneration, accident, or disease; it may render a man liable to venereal infection; it may, by devitalizing the tissues of the body, reduce its powers of resistance to infection, as in tuberculosis or syphilis; it may shorten the expectation of life by as much as fifteen years; it may lead to neglect and malnutrition of the child of the dissolute parent; or it may possibly impair the reproductive cells of the parent and thus affect injuriously the offspring. Inquiries into the defective development, disease, or early death in the children of alcoholic parents, or into the pathological condition of the reproductive organs of alcoholic subjects of alcoholized animals, yield significant evidence as to the potentiality of alcohol as an injurious agent."

Thus the great fact stands clearly before us, 51,500,000 gallons of absolute alcohol soak into the national life, and beyond the pleasure of the sensuous enjoyment it gives to those who like it, it is responsible directly or indirectly for this great stream of mortality and morbidity, death and disease in our national life. Truly, as the *Lancet* said in April, 1928, "the problem is more serious to-day than it was in 1913"; more serious, we would add, not only because of the present biological and economic position of the country as a result of the drainage of war upon national resources, but because we have seen what wise restriction could do, and in the light of modern science we know the essential effect of alcohol upon the moral and physical life of man, and how constantly it acts as a drag on the wheels of progress and efficiency.

Facilities for creating and perpetuating the fact.—As the primary source of the fact, we must recognize that it lies in the will of the people. First, under the influence of example, or suggestion, or it may be at the actual solicitation of a moderate drinker, the individual wills to embark

on the sea of what is to be moderate drinking. Secondly, in the will which has gradually lost its guidance and power, until by almost imperceptible changes, the alcoholist, the would-be-moderate-drinker, has succumbed to the deceptive power of the drug and becomes the alcoholic. This is, of course, the root of the whole business—through the example of the moderate drinker, and through the social forces of convention and custom, the tradition of alcoholic indulgence is maintained.

Passing from this, the fundamental source, to those which are secondary, we are at once face to face with the fact that alcohol can and does produce that careless sense of well-being which is at once its charm and allurement. No final progress will be made until our young people realize that our appeal is away from this sensuous enjoyment to the vision of a great ideal, the vision of service for the sake of others.

THE NATIONAL DRINK BILL—1927
GREAT BRITAIN

	England and Wales.	*Scotland*	*Great Britain.*
Population - -	39,290,000	4,895,000	44,185,000
Expenditure - -	£271,285,000	£27,515,000	£298,800,000
Per Head - -	£6 18s. 0d.	£5 12s. 0d.	£6 15s. 3d.
Spirits (Proof Galls.) - - -	0.26	0.50	0.29
Beer (Bulk Galls.)	23.0	8.6	21.3
Wine - - - -	—	—	16,628,000 (Galls.)

(G. B. Wilson)

The total consumption of absolute alcohol per head was: England and Wales 1.25 gallons, Scotland 0.74 gallons, Great Britain 1.16 gallons. The taxation collected by the Trade from the consumers of alcoholic liquor in 1927 was in round

figures, £128,500,000 or about 43 per cent. of the total bill.

The amount paid directly by the Trade for licence duties and monopoly values was £4,330,024.

The profits accruing to the Trade from this business were stated by the Financial Secretary to the Treasury (May 16th, 1928) to have been £10,000,000 before the War, £19,250,000 in 1921-22, £22,250,000 in 1922-23, £23,250,000 in 1923-24, and £24,500,000 in 1926-1927. These figures help to dispel a good many fictions of the pro-liquor press, and of the claim so often made that the Trade pays £128,000,000 to the revenue. The Trade simply makes over what it has extracted from the pockets of its clients—they pay, not the Trade.

Through the courtesy of the Irish Association for Prevention of Intemperance and from official sources, we present:

IRISH FREE STATE DRINK BILL, 1927

Spirits	1,052,826 galls.	at 106s.	per gall.,	£5,579,978
Beer	25,257,060 "	7s.	"	8,839,971
Wine	591,743 "	40s.	"	1,183,486
Cider	87,316 "	5s.	"	21,829
Total	26,988,945 galls.			£15,625,264

or 9.07 galls. at £5 5s. 1d. per head.
(1926, 9.10 galls. at £5 4s. 2d.)

The only figures officially available from Northern Ireland are incomplete. The consumption of spirits 1922-23 was 0.38 gallons per head, 1923-24 it was 0.24, 1924-25, 0.31, and 1925-26 it fell to 0.28 gallons per head.

With regard to beer, "the revenue returns show that the consumption of beer throughout the province is steadily diminishing, the use of wine throughout the United Kingdom generally tends to increase, and I think this applies to some extent to N. Ireland also." (From an official source.)

Licensed Premises and Clubs.—According to the latest (August, 1928) licensing statistics, there were on the 1st of

January, 1927, 79,330 on-licensed premises, being 20.19 per 10,000 persons, and one on-licensed premises for every 495 persons.

There were 22,174 off-licensed premises, being 5.64 per 10,000.

In 1908, the 95,517 on-licensed premises equalled 27.24 per 10,000.

Clubs.—On January 1st, 1927, there were 12,481 registered clubs, showing an increase of 343 during the previous year. Since 1904, clubs have increased by 6,110 whilst on-licenses have decreased by 20,148. It is estimated that during 1927 clubs have increased by 300.

In the last report of the Working Men's Club and Institute Union, Ltd., there were at the end of 1927, 2,544 affiliated clubs with a membership of 907,421. Of these clubs, 2,470 supply intoxicating liquors. Refreshments of all kinds cost £7,736,026, and the report says: "Expenditure on food is obviously negligible." From the tax paid, Mr. G. B. Wilson says that about £6,300,000 was on drink, equal to £2,560 per club. In one club report shown me confidentially, a very large sum was spent on intoxicants, a quite insignificant sum on 'provisions,' and 1s. 6d. on Oxo! Probably about £32,000,000 was spent on 'drink' in all the registered clubs combined. In the Irish Free State, in 1927, there were 238 clubs spending £194,133 on intoxicants, or £815 per club; the same number of clubs in 1926 spent £957 per club. There were also issued 17,896 licences, including 13,801 for retailing of spirits, 408 for beer, and 1,103 for wines and sweets.

Hours during which licensed premises may be open for sale of liquor are at present, 9 in London, 8 to 8½ in the provinces. The hour of closing is for nearly 95 per cent. of the population, 10 o'clock p.m., about 4½ per cent. the hour is 10.30 p.m., and for the rest 11 p.m. The *Alliance*

Year Book for 1929 has a full and detailed account of the various divisions of England and Wales, with their populations and hours of closing.

Whilst thus outlining the facilities for providing the 'scourge which ravages the health of the people,' it may be as well to record that under the Government Rating Relief Scheme, the Trade, which last year made a profit of £24,500,000, is to receive a dole of £400,000, and incidentally another of £250,000 to the equally wealthy tobacco trade.

Official Evidences of the Fact of Damage due to Alcohol.—What the indulgence in alcoholic beverage costs the nation, from the point of view of health and efficiency, how far it is a factor in disease, crime, and moral degradation, appears in part in the chapters of this little book. Here we shall look at some of them from a somewhat different angle of vision.

(*a*) *Convictions for Drunkenness.*—The total number of convictions for drunkenness in England and Wales, 1927, was 65,166, a decrease of 1,960 on 1926; whilst in 1908 the convictions were 174,277. Of these 65,166, 54,555, or 84 per cent., were males, and 10,611, or 16 per cent., were females. These figures number 2½ times the low record of 1918, when it was 29,075.

Between 9 per cent, and 11 per cent. of all arrests leading to conviction occurred on Sundays, Tuesdays, Wednesdays, and Thursdays; 12 per cent. on Mondays, 16 per cent. on Fridays, and 33 per cent. on Saturdays.

These figures show the value of 'Sunday closing'; whereas 9-11 per cent. of the convictions arise on Sundays in England, they are 2.3 per cent. in Northern Ireland. The figures for Glasgow tell the same story. In 1921, out of 10,465 arrests during the year, 335 occurred on Sunday; in 1927, out of 7,964 only 217 occurred, *i.e.*, 2.7 per cent. (Chief Constable of Glasgow, December, 1928.)

Methylated spirits, as a cause of conviction, increased

from 389 in 1926 to 428 in 1927, *i.e.*, 271 males and 157 females.

The arrests for drunkenness in Northern Ireland were 4,727 on week days and 115 on Sundays, total 4,842. (In 1923, the figures were 6,464 and 310; total 6,774.)

Under Section 40 of the Criminal Justice Act, 1925, there were during 1927, 1,438 convictions of persons for drunkenness whilst in charge of mechanically propelled vehicles. These were disqualified from holding a licence for 12 months. In 1926 there were 804 such convictions. In the light of these convictions, we may note that since 1918 there have been 1,000,000 street accidents in Great Britain, and of these 40,000 proved fatal. Approximately 250,000 of the casualties were to children. The causes of accidents were stated to be: state of roads, 6 per cent.; mechanical failures, 7 per cent.; weather, 4 per cent.; and the remaining 83 per cent. to errors of judgment on the part of pedestrians, cyclists, and motorists. Naturally a pair of legs or a pedal machine need as much control in their way as the Rolls-Royce.

Viscount Chelwood, in the House of Lords, gave these figures (quoted from the *Journal of State Medicine*):

People killed every year on the roads of this country, 5,000; people injured, 150,000; accidents to persons or property, 300,000; people killed each day during daylight hours, 10. Annual death rate per 1,000 cars in this country, 2.44; in United States of America, 1.0 per 1,000.

(*b*) *Disease and Death.*—There are, in the more definitely appropriate places in the chapters of this book, a number of data derived from various official sources. Here we look at certain great broad facts.

The first thing to note is that, contrary to much popular opinion, the classes which suffer the heaviest recorded death from alcoholism and its allied diseases are the upper and

upper middle classes; that is to say, those who have the means to drink and the accompanying lack of control to keep it within the 'so-called' physiological bounds; whilst the Trade pays its own special price for its contact with alcoholic beverages. Much might be said. One thing is clear—the figures dispose of the pretty fiction dictated to the House of Lords: "give people better houses, increase the number of recreation grounds, and they will do the rest. They are doing the rest." Yes, coupled with sound temperance teaching in our Bands of Hope and schools, they have done much and will do more, but the upper and upper middle classes need something besides 'better houses' and 'more golf-links': they need sound, scientific education and emancipation from the thralldom and tyranny of custom.

ALCOHOLISM AND DISEASE

Social Class.	*Deaths from all Causes.*	*Cirrhosis of Liver.*	*Cancer.*	*Pneumonia.*	*Diseases of Digestive System.*	*Chronic Nephritis.*	*Syphilis.*	*Suicide.*	*Cancer of Tongue.*	*Cancer of Œsophagus.*
All Occupied and Retired Civilian Males -	1,000	9.6	128.4	85.1	59.5	34.5	27.1	24.3	7.5	9.7
Class I. -	812	15.6	102.5	70.5	75.8	34.3	19.7	28.1	3.6	7.4
" II -	942	17.9	118.1	71.6	72.9	38.9	24.7	31.0	5.5	8.8
" III. -	951	6.3	127.1	76.2	52.6	33.4	26.1	22.0	7.1	10.1
" IV. -	1,007	7.1	123.8	91.1	55.7	31.4	26.0	21.6	7.5	8.5
" V. -	1,258	8.3	157.8	127.8	63.5	36.7	37.9	23.7	12.4	12.6
Publicans -	1,585	170.9	163.7	137.1	205.4	78.1	30.0	63.4	12.4	17.8
Barmen -	1,955	56.0	229.9	162.9	137.3	88.7	57.9	40.2	41.2	41.6
Brewers -	1,346	76.8	179.5	37.9	186.4	55.9	130.3	64.4	24.7	37.9
Cellarmen -	1,510	45.1	231.3	80.6	110.5	66.6	46.0	39.4	6.1	44.4

These figures are striking. But now look at the result when we take the ten groups, irrespective of their social class, with the highest alcoholism rate and compare them with the ten with the lowest alcoholism rate.

	Cirrhosis of Liver.	*Cancer.*	*Pneumonia.*	*Diseases of Digestive System.*	*Chronic Nephritis.*	*Syphilis.*	*Suicide.*	*Cancer of Tongue.*	*Cancer of Œsophagus.*
Ten Highest All Occupied and Retired Males	48.0	167.4	89.8	118.0	65.5	47.4	37.4	12.3	21.5
- Ten Lowest	9.6	128.4	85.1	59.5	34.5	27.1	24.3	7.5	9.7
	2.4	121.5	82.3	45.9	27.8	17.3	21.3	5.6	9.8

We do not claim that alcoholism is the only factor in this tragic record, but there is beyond all cavil a definite correlation between alcohol and these other conditions—the sort of relation expressed by the late Sir Andrew Clark, that "more than three-fourths of the disorders in what we call fashionable life arise from the use of alcohol."

Some readers find comparative mortality figures rather difficult, so we have worked out the death rates per 100,000 for alcoholism, cirrhosis of the liver, arterio-sclerosis, cancer, pneumonia, other diseases of the digestive system, chronic nephritis, and suicide—a group of conditions closely allied with alcoholism. The death rate per 100,000 (males 20-65 years) in Class I., 499; Class II., 471; Class III., 341; Class IV., 316; Class V., 435. The average for occupied and retired males, 20-65, is 368, and that for the Trade is 1,289. For various individuals the total death rate per 100,000 from these diseases is: solicitors, 886; registered medical practitioners, 760; authors, editors, and journalists, 639; dentists, 559; insurance officials, 486; bank officials,

416; agricultural labourers, 330; teachers, 314; and coal miners (hewers and getters), 223. The effect of alcoholism on mortality (as with syphilis) is shown in the next table. The groups in each class are arranged in the order of their comparative mortality figures. The number of deaths in some cases is quite small, but in Classes I. and II., with the heaviest general mortality from alcohol, those occupational groups with the heavier alcoholic percentage rise regularly. In Classes III. and IV. where the alcoholic incidence is in any case much less, the relationship is not so marked.

EFFECT OF ALCOHOLISM ON MORTALITY

Social Class and its C.M.F.	*C.M.F. and Number of Groups involved.*				
	500-700	701-900	901-1,200	1,201-1,500	1501-
Class I. 812 -	4 Groups 1.27	3 Groups 1.8	6 Groups 2.4	—	—
Class II. 942 -	2 Groups 1.09	4 Groups 1.2	6 Groups 1.7	—	—
Class III. 951 -	4 Groups .4	21 Groups .7	44 Groups .6	19 Groups .9	3 Groups .8
Class IV. 1,007 -	1 Group .5	2 Groups 1.4	13 Groups .4	9 Groups .6	5 Groups 2.1
Class V. 1,258 -	—	—	3 Groups .5	4 Groups .4	2 Groups 1.0

These figures represent the percentage of deaths from all causes that were due to alcoholism.

Dr. Vernon worked out a somewhat similar percentage for 1910-12. It is not so easy to get the marked contrasts in the 1921-23 figures, partly because of the great decrease generally in the alcoholic incidence. Then, too, it is difficult to make a strict comparison for the two series of years, because in 1921-23 the basis of calculation and, to a certain extent, classification has been altered.

Whatever the cause, whether it be increased cost or the result of education, or both, all the classes, even the Trade, show a quite marked reduction in mortality ascribed to alcoholism. Inn-, hotel-keepers, and publicans, for example, had more than 25 per cent. less mortality in 1921-23 than in 1910-12. They had 603 deaths in the former years and 357 in 1921-23.

It is sometimes asked, Why, if alcoholic indulgence is declining, does *cancer* continue to increase? The answer is that alcohol is not *the* cause of cancer, but a factor in the preparation of the soil in which cancer can flourish. Then, cancer is to-day more accurately diagnosed, and, most important, cancer is pre-eminently one of the 'after-40-years-of-age' causes of death. With the increased expectation of life, more people live into the age period in which cancer is a cause of death. In 1926 there were 24,437 deaths from cancer in males, and 27,783 in females. Of these 53,220 deaths, whilst 2,448 died before 40, 50,772 died after 40 years of age. So that while the death rate per million before 40 is 86, that after 40 is 475. Whilst these facts need to be remembered, we have also the very clear evidence that alcohol is one of the great factors in the incidence of a cancer mortality.

Sir Berkeley Moynihan reminded us recently that one out of seven who die after 30 die of cancer. He pointed out that cancer hardly ever attacks a healthy organ. "Most people," he said, "may be considered to commit suicide if we consider the effect of alcohol, syphilis, tubercle, of the conditions which are set going by the rush for wealth, with all its attendant sacrifices of caution and prudence with regard to health from day to day. The statement, though shocking, appears to be true." Here alcohol is put first in the list of factors which prepare the soil for the reception and aid the growth and development of cancer.

The relation of chronic alcoholism to cancer has recently

been examined by a special committee of the Medical Research Council ('An Investigation into the Statistics of Cancer in Different Trades and Professions,' Special Report series, No. 99. H.M. Stationery Office, price 1s. 6d.). The committee investigated 43,000 cases. Their reference to cancer of the tongue says: "Among the groups in which cancer of the tongue is in excess of expectation are those like members of the licensed trade, who are supposed to consume an excessive amount of alcohol. On the other hand, the list of those occupations with a low incidence of cancer of the tongue does not include any group with a high death rate from alcoholic diseases." With regard to the œsophagus (gullet)—"Among the groups that have an excessive incidence of cancer of the gullet there is again a relative large number of deaths among those engaged in the liquor trade—brewers, innkeepers, publicans, beer-bottlers. Again, no group with a high death rate for alcoholism is found among the groups with unusually low incidence of this form of cancer. There would appear to be very suggestive, if not practically conclusive evidence that the consumption of an excessive amount of alcohol predisposes, and indeed is intimately related as a causal factor to the frequency of and mortality from cancer."

If we arrange 178 occupational groups in order according to their death rate from cancer, then ministers are No. 1, clergy 2, bank officials 3, and then at the other end come innkeepers 143, brewers 154, barmen 174, cellarmen 175, tin miners 176, grinders 177, waiters 178.

Tuberculosis.—We add nothing to what was said in former editions with regard to tuberculosis and the influence of alcohol, except, first, to remind non-medical readers that this is a disease which has a very high-class and occupational incidence due to specific conditions quite apart from alcohol. Secondly, to note that Dr. Rollier of Leysin is most

emphatic about alcohol and consumption, and Dr. Saleeby tells me that in twenty-five years Rollier has not once prescribed alcohol in the treatment of tuberculosis.

Pneumonia.—That alcohol predisposes to pneumonia has long been recognized. In the 73rd Annual Report of the Registrar-General, the diagram, which was reproduced in the last edition, shows graphically the greater mortality among men than among women, due partly to greater exposure to risk, but accelerated by alcoholic indulgence.

This relationship still obtains, and for 1927 the deaths from lobar pneumonia at age 20-25 were 242 men and 114 women; at 30-35, 290 men and 207 women; and at 40-45, 532 men and 253 women. A similar diagram for 1927 would present substantially the same features, although, probably due in part to decreased drinking, the downward peak for ages 25-35 would be rather lower—the number of cases of lobar pneumonia in males being 554 and women 331. The effect of alcohol on pneumonia in the social classes is indicated in the accompanying table:

PNEUMONIA AND ALCOHOLISM IN SOCIAL CLASSES

Social Class	*Groups with a High Rate for Cirrhosis of Liver.*		*Average C.M.F. for the Class.*		*Groups with a Low Rate for Cirrhosis of Liver.*	
	Cirrhosis.	*Pneumonia.*	*Cirrhosis.*	*Pneumonia.*	*Cirrhosis.*	*Pneumonia.*
Class I. - -	25.4	86.2	15.6	70.5	5.0	46.2
" II. - -	21.2	88.5	17.9	71.6	8.6	63.9
" III. - -	11.8	82.3	6.3	76.2	3.6	79.6
" IV. - -	12.6	129.8	7.1	91.1	3.5	101.9
" V. - -	12.2	162.2	8.3	127.8	5.1	125.5
Average - -	16.6	109.8	11.0	87.4	5.1	83.4

These figures mean that in Class V., for example, the average mortality from cirrhosis for the class is 8.3 and pneumonia 127.8. In those groups, however, with a higher cirrhosis rate, pneumonia rate goes up to 162.2, whilst in those with a lower cirrhosis rate it drops to 125.5, and so for the others—more marked in Class I., where alcohol seems to undo the work of social position and lessened risk.

Thus, in conjunction with many points elsewhere in these chapters, we seek to set forth this evidence from strictly official sources, that alcohol is a powerful co-operating agency, that it is indeed an ally of the captains of death in our own national life.

Before leaving this aspect of the fact, we may refer briefly to some foreign evidence in support.

Just before his death, Professor Kræpelin (to whose splendid work full reference is made by Horsley and Sturge) wrote a paper on 'The Influence of the Diminution of Alcohol during the War,' based on medical experience in Bavaria.

Beer is the principal form of alcoholic beverage. The consumption fell from 232 litres per head in pre-war days to 138.8 litres in 1918. Some results were: delirium tremens cases fell from 2,598 in 1910-13 to 476 in 1918; acute alcoholism deaths fell from 1.15 per 10,000 inhabitants to 0.28. Admissions for alcoholism fell from 5,515 in 1910-13 to 1,322 in 1915-18—a drop of 77.6 per cent, in males and 68.5 per cent. in females.

Admissions to mental hospitals for alcoholic mental disease were 26.0 per cent of all admissions in 1912, and fell year by year to 5.3 per cent. in 1918.

As we have seen (Chapter II. on nervous disease), this rate is rising with the increased per capita consumption of a stronger beer.

In one of the general hospitals in Munich, alcoholic diseases of the stomach and intestinal canal became 24.9 per cent. of pre-war average; heart complaints, 17 per cent.; arterio-sclerosis, 29.5 per cent.; gout, 16.2 per cent.; kidney disease, 27.2 per cent.; and liver disease, 78.1 per cent. of pre-war averages. Those who read German will find much information in Dr. Johannes Thiken's *Handbook,* published by Neuland-Verlag, Berlin, and in numbers of *The International Review against Alcoholism.*

REGISTRATION STATES OF AMERICA, 1925 (1916 IN BRACKETS)
DEATH RATES PER 100,000 FROM ALCOHOLISM, ETC.

	Alcoholism.	*Cirrhosis of Liver.*	*Cancer*	*Pneumonia.*	*Chronic Bright's Disease.*	*Suicide.*
A -	4.8 (8.3)	8.5 (13.4)	105.9 (90.0)	104.1 (150.2)	91.7 (103.4)	13.5 (16.5)
B -	3.5 (5.8)	7.3 (11.8)	92.6 (81.5)	92.3 (137.0)	90.2 (97.0)	12.5 (13.8)
C -	2.4 (3.5)	6.0 (8.0)	84.5 (72.0)	83.5 (115.5)	91.8 (83.4)	11.2 (11.6)

A=States with a higher death rate from alcoholism than average.
B=Average death rates for Registration States.
C=States with a lower death rate from alcoholism than average.

America.—These comparative figures from U.S.A. are interesting. In reading them, it must be borne in mind that death certification of alcoholism and cirrhosis has been much higher than in England, and we cannot altogether compare, say, England and Wales or Scotland with America, the conditions being so different, but with a population of 103,000,000 we can compare the States as a whole with their own past records, and the individual States or groups of States with each other, up to a point. We say up to a point, because, of course, for a strict comparison, such features as urbanization, density of population, per capita

wealth, percentage of coloured population, would all need to be reckoned with. I have very carefully gone into all these and other features, and am persuaded that the comparative figures here set forth do give a general but definite idea of the correlation between drink and disease, and confirm very largely our experience as to the relation between wealth and alcoholism.

Prior to 1915, some States had State-wide prohibition, a second group had nearly 75 per cent. of their population under no-licence, another group had 50 per cent. under no-licence, whilst a fourth had practically no no-licence. We term them prohibition, near prohibition, half licence and full license. A comparison of their death rates in 1916 and 1925 is interesting (1925 is the last year for which official statistics were available when going to press).

DEATH RATES PER 100,000 IN REGISTRATION STATES, 1925 (1916 IN BRACKETS)

ARRANGED IN ORDER OF DEGREE OF RESTRICTIVE LEGISLATION PRIOR TO 1915

*States Degree of Legislation in 1914.**	*Alcoholism.*	*Cirrhosis of Liver.*	*Cancer.*	*Pneumonia.*	*Chronic Bright's Disease.*	*Suicide.*
Prohibition - -	1.6	4.8	73.07	75.3	90.2	8.0
	(2.8)	(7.3)	(75.7)	(110.1)	(74.0)	(9.1)
Near Prohibition -	2.7	5.4	80.9	79.5	91.0	10.5
	(3.8)	(8.0)	(75.0)	(114.5)	(86.6)	(11.4)
Half Licence - -	3.6	7.6	106.8	94.2	87.3	11.1
	(5.4)	(10.9)	(83.0)	(125.0)	(89.5)	(15.9)
Full Licence - -	5.5	8.8	104.6	112.6	101.4	12.6
	(9.2)	(13.4)	(81.8)	(164.7)	(112.4)	(15.8)

*The Alcoholic Psychoses in these four groups of States run 5.4, 8.9, 12.2, 11.8 per cent. of all first admissions in 1910 and 1.6, 3.0, 4.0, 4.8 in 1922 (latest available figures).

It is well, perhaps, to note the degree of 'public health conscience' in these States. Dr. Ferrel, Director of the U.S. International Health Board of the Rockefeller Foundation, in 'The Economics of Public Health' (*Journal of American Medical Association,* July 9th, 1927), has a luminous article. Among other details, he says: "Quite a large number of communities are making relatively large appropriations for public health purposes who have neither alarming health hazards nor exceptionally favourable economic conditions. The causes for such general support will vary, but generally speaking it will be found that the community is well educated in public health matters, and this in turn generally means that it has enjoyed capable public health leadership." The per capita income of the States grouped in the last table run thus: prohibition States, $517; near prohibition, $540; half licence, $796; full licence, $923. So the ability to 'drink' and the will to 'drink,' and the mortality from 'drink,' run together. But when it comes to public health, the per capita appropriation for public health purposes is in the reverse proportional order. The prohibition States seem to have realized the value of life and health and are prepared to pay for it. The average per capita appropriation by these various groups runs from prohibition States downwards in this order, $0.115, $0.071, $0.090, $0.115, per head. In proportion to their wealth, however, the figures should be 0.115, 0.120, 0.175, 0.205 from above downwards. The fight against alcohol and alcoholism and the recognition of the real value of health run together; and it may indeed be true that 'capable public health leadership' necessarily involves a clear-cut issue against alcoholic indulgence.

The British Commonwealth

From America, we may turn for a moment to the Commonwealth and present these figures:

Country. 1922-1926.	*Cirrhosis of Liver Death Rate per* 100,000. *Convictions for Drunkenness per* 100,000.	*Acute and Chronic Nephritis.*	*Suicide.*	*Insanity. Percentage of all admissions in which Alcohol was Principal or Contributory Cause.*	*Per Capita Consumption (Gallons)*		
					Sp.	*B.*	*W.*
Australia -	5.1 (99.6)	46.8	10.9	8.7	.41	11.2	.50
New Zealand	3.3 (52.9)	28.2	12.0	5.3	.44	9.6	.13
Canada* -	2.1 (41.3)	35.4	8.3	—	.26	4.7	.05
South Africa†	4.5 (45.1)	27.4	11.1	—	—	—	—

From these official statistics, pass for one moment to another aspect revealed by Dr. Bertholet's painstaking work in the post-mortem room at Lausanne. In the chapter on racial poisons, we refer to his statistics and figures concerning one organ of the body. Here is a graphic picture of the widespread damage wrought by heavy drinking on the various organs of the body. The terms used are explained in the previous chapter. These two diagrams show how much more disease he found in alcoholics as compared with non-alcoholics. He investigated the condition of the testicle, heart, kidneys, liver, stomach, and for signs of tuberculosis, pneumonia, and a disease of the covering of the brain, pachymeningitis. (See page 167).

We have thus sought to show that alcoholic indulgence is the greatest single factor co-operating with others in

* Registration area.

†European Union, convictions for drunkenness per 100,000 over 15 years of age. Figures from Year Books and official information from Government sources (August, 1928).

the production of a vast amount of damaged physical life, in addition to the effect of excess in the production of drunkenness.

(*c*) The third strand of evidence is derived from

Insurance and Friendly Society Experience

The Friendly Societies from our present point of view may be divided into those run on a total abstinence basis, such as the Rechabites and Sons of Temperance, and the non-abstaining, such as Foresters, Oddfellows, Druids, etc., many of whose individual members are of course total abstainers.

All these societies are showing a very marked increase in sickness rate among insured persons, and especially among their younger members. The fact is commented upon by the actuaries drawing up their quinquennial valuations, has been discussed by the British Medical Association, and in the Scottish Board of Health Report for 1927 a considerable space is devoted to the question.

In the last edition (Horsley and Sturge), Sir Arthur Newsholme quoted some figures relative to certain Australian societies. Those figures referred to the years 1895-99, published in 1902. We, therefore, wrote to the Public Actuary for recent figures. He very kindly sent full reports, including a copy of that for 1902. 'Unfortunately, there has been a change of actuarial method, and consequently the figures for 1920-1924, published in 1926, are not strictly comparable with the former.

In the 1926 report the amount of sickness was much the same for both sets of societies, and with the death rates are given in terms of actual to expected sickness or death:

Abstaining societies, deaths (actual) were 39 per cent. of the expected, average 41-2 years.
Non-abstaining, deaths (actual) were 60 per cent of the expected, average age 42 years.

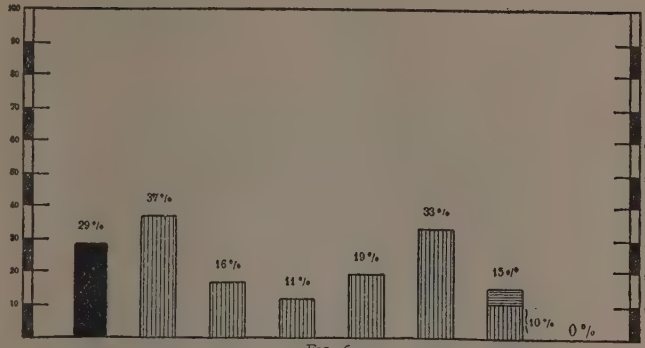

FIG. 6.

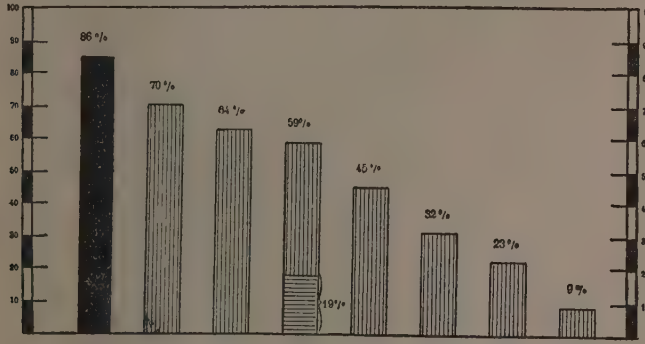

FIG. 7.

FIGS. 6 AND 7.—DIAGRAMS SHOWING THE ALTERATIONS FOUND AFTER DEATH IN CERTAIN ORGANS OF 100 NON-ALCOHOLICS AND 163 ALCOHOLICS.

From left to right the columns and figures refer to the following organs: testicle, heart, kidney, liver, stomach. Then to three conditions—the signs of tuberculosis, pneumonia, and inflammation of coverings of the brain.

The figures mean that in the two groups of cases, 29 per cent. and 86 per cent. respectively, showed gross disease of testicles. In Fig. 7, 59 per cent. showed disease of liver, of which 19 per cent. was due to cirrhosis and 40 per cent. enlargement and fatty degeneration. No cirrhosis in Fig. 6 and only 11 per cent. fatty degeneration.

The mortality of the sick members was 5.5 per cent. in abstainers and 7.0 per cent. in non-abstainers. The sickness rate was as noted about the same in both groups, but in certain societies operating in mining areas, with increased hazards, the non-abstainers averaged 10 weeks' sickness per member, the abstainers 8.4 weeks per member. The particulars sent were so complete that we worked out the figures for the whole forty societies for the three quinquennial periods, 1910-1924.

FORTY FRIENDLY SOCIETIES, SOUTH AUSTRALIA (1910-1924)

	Percentage of Actual to Expected Deaths.	*Percentage of Actual to Expected Sickness.*	*Average Age of Members.*
All Societies (40) -	5.8% less	9.9% less	40 years
Abstainers (only) -	33.8% less	20.9% less	40½ years

The different areas in which all these societies operated, the members exposed to risk, and the age incidence, made these figures possibly unduly heavy against the non-abstainers. We therefore worked out the figures for three non-abstaining societies operating as far as possible under the same conditions as three abstaining societies. The results of 15 years' experience up to 1924 is:

Three non-abstaining societies, 19.0 per cent. less death and 115 per cent. less sickness than expected.
Three abstaining societies, 33.8 per cent. less death and 20.9 per cent. less sickness.

(The actuarial calculations were made on the basis of certain life tables, which in view of these and other results will be revised in the next actuarial report.)

The English friendly societies are experiencing the same heavy sickness rate, which is about the same for both classes. This is, I believe, due partly to the decreased drinking among the non-abstainers. That is to say, the amount of alcohol consumed even by drinkers is less and so the differences are not so acute (see later on Life Insurance experience). With the death rates, however, there is a very different story, especially after the age of 20 years.

Thus the Rechabites have a definitely increased expectation of life at all ages from 20 years upwards as compared with the general population at each age period. So, too, with the Sons of Temperance. I am much indebted to Mr. J. McG. McIntyre for placing much official information in my hands, including the full original report of the actuary. That report says: "The actual aggregate deaths are 2,786 against 3,699 expected, *i.e.*, 27 per cent. less than expected. The deaths at earlier periods of life are heavier, but from 20 to 43 the mortality is nearly uniform and constant, whereas for the population as a whole the rates of mortality increase more than double within this range of years. After age 30 your mortality is considerably below that of any of the experiences by which I have tested it, even lower than your own earlier (*i.e.*, past years) experience. At age 50 your mortality is but slightly over 7 per 1,000, and this is the same as is shown by the English Life Table, No. 9 for age 40 (males)."

This remarkable experience does not include 47,247 assurance members; had these been added the position would have been even better. In the table we show the mortality rate at different age periods for different groups. The figures are obtained from Actuary's Report for Sons of Temperance and the Registrar-General's *Statistical Review* for 1921-25 for whole population, and *Decennial Supplement* for farmers, publicans, and barmen.

MORTALITY RATES AT DIFFERENT AGE PERIODS (MALES)

Group.	*Death Rates per 1,000 at specified Age Period.*				
	20.	25.	35.	45.	55.
Whole Population (1921-25) - - - -	3.5	4.0	6.5	11.5	24.7
Farmers (1921-23) - -	1.9	3.0	4.4	7.6	17.1
Publicans (1921-23 - -	2.3	5.7	12.5	20.9	36.6
Barmen (1921-23) - -	5.2	6.6	16.0	24.1	45.6
Average for Classes III., IV., and V. - - - -	3.7	4.3	7.1	12.5	26.8
Sons of Temp. (1921-25) -	3.5	3.8	4.1	5.4	10.2

(Generally speaking, the Sons of Temperance belong to Classes III., IV., V.)

There could hardly be a more striking piece of evidence of the relation between alcoholic indulgence and mortality.

From this experience we turn naturally to the wider experience of the great insurance societies. The general results are familiar and we shall not dwell at length on them. The summary experience to date is:

SCOTTISH TEMPERANCE AND GENERAL ASSURANCE CO.

1883-1887. In temperance section, actual claims, 35 per cent. of expected, and, in general, 62 per cent.
1923-1927. In temperance section, actual claims, 53 per cent. of expected, and, in general, 60 per cent.

ABSTAINERS AND GENERAL INSURANCE CO.

Forty-four years (1884-1927), 5,006 expected deaths, but actual were only 2,413 (war included) or 2,163 (war excluded), these actual deaths being 43.2 per cent. of the expected, whilst in the general section 50.3 per cent. oc-

curred. The Sceptre Fund had 58 per cent. actual deaths in temperance section and 82 per cent. in the general; whilst United Kingdom Temperance and General Provident Institution had 56.1 per cent. in the temperance and 61.8 per cent. in the general. Note that with the decreasing consumption of alcohol the demarcation between drinkers and non-drinkers though present is not quite so marked as in earlier years, when the drinker probably drank more than he does to-day.

Afew years ago a medical actuarial mortality investigation was made in America, covering no less than 6,000,000 lives. The result was a most profound confirmation of these figures, and of the general belief that as a class, and as a whole, abstainers have a lower mortality than non-abstainers. It is sometimes said that these mortalities are increased by the heavy drinkers, but Dr. Porter investigated the amount of alcohol consumed and found that taking the death rate of abstainers as 100, then temperate but not daily users of alcohol were represented by 120, moderate daily drinkers by 136 (the age periods involved are not given, so that the observation is only of limited value).

The Medico Actuarial Investigation Committee worked out the cost of insurance experience and found:

11,323 free daily users of alcohol had 698 deaths instead of 374 at a cost of $650,000.
30,707 quite moderate users of alcohol had 1,725 deaths instead of 1,460 at a cost of $530,000.
13,500 using alcohol to excess occasionally had 745 deaths instead of 535 at a cost of $420,000.
60,000 in the Trade had 4,495 deaths instead of 3,179 at a cost of $2,500,000.

(Oscar Rogers, *The Effect of Alcohol on Longevity*, U.S.A., 1923.)

(*d*) A fourth line of evidence comes from *Industrial Life and Economics.*

How alcoholic indulgence was found to be a hindrance to the successful prosecution of the War, and what a profound effect war-time control and restrictions had upon industrial and economic welfare, is a well-known story.

It is difficult to present the full picture of the effect of alcohol on industry, because of the changes in industrial life since the War, and the alteration in money and other values. There are, however, certain points worthy of record. Mr. F. G. Creed, to whom we are indebted for his figures up to date, managing director of Creed & Co., electrical engineers, Croydon, decided some years ago to run the works on total abstinence principles. He says: "In these days in the ordinary engineering trades the amount of lost time averaged about 10 per cent., whereas in our case the amount of lost time averaged half of 1 per cent.—one hour out of two hundred instead of twenty out of two hundred." During the War the total abstinence rule could not be altogether maintained, but even then "we had remarkably good results—our lost time amounted to 5 per cent., but other firms doing similar work rose to 15 per cent." Since then the earlier experience has been confirmed, although as elsewhere, for some reason, there is some increase in the amount of sickness. The chief points sent by Mr. Creed (18th June, 1928) are as follows:

(i) Better time keeping. The loss of time, all causes, unpunctuality, sickness, accident, leave of absence (other than holidays).
1926. 3.066 per cent. 1927. 2.561 per cent.

(ii) Less time lost through sickness and accident.
1925. 2.117 per cent. 1926. 1.624 per cent.
1927. 1.413 per cent.

(iii) Average number of employees, 1925-1927, were 165, 212, and 231.

(iv) Workmen's compensation insurance premiums paid:
1925. £18 1s. 8d. 1926. £77 0s. 0d.
1927. £103 13s. 2d.

(v) Workmen's compensation claims paid:
1925. (4) £46 13s. 9d., including £30 paid for a finger accident, the heaviest year since 1920.
1926 (3) £2 10s. 5d. 1927 (4) £9 5s. 6d.

These are small figures, and naturally too much reliance must not be placed on one small experiment. Through the kindness of a large number of directors, secretaries, and others concerned with large industrial undertakings of all kinds, we had the returns for loss of time through sickness and accident, from firms representing nearly 100,000 workpeople. The figures were not kept on a uniform basis, but they averaged nearly 5 per cent. where Creed's was 1.4 per cent. The complete loss of time could not be given in many cases.

If total abstinence makes a difference of only 3½ per cent. along this one line alone, we can easily see what a charge upon industry drinking habits might involve; because, there is not only loss of time through actual sickness or accident, but there is the coincident dislocation of services and most probably a consequent lack of efficiency.

In his book, *The Alcohol Problem,* Dr. H. M. Vernon, who had a unique experience during the War, estimates the drink-caused loss of efficiency at 10 per cent. Various estimates have put the gain to efficiency in America at anything up to 17 per cent.

According to the *Board of Trade Journal,* certain trades, employing 5,418,677 employees, had in 1924 an output of net value of £1,217,307,000. Suppose the efficiency of these 5½ million workers was increased only 5 per cent., it will at once be apparent that there would not only be an increased output, but there would be probably a demand for increased workers and absorption of some unemployed, and, moreover, the money now spent on 'drink' would be diverted to more productive channels and to a general increase of industrial welfare.

There is another aspect of far-reaching import in the life of the people when alcoholic indulgence is reduced.

Mr. Franklin Martin, President of the American College of Surgeons, speaking at the British Medical Association breakfast (1928), said that under prohibition workmen did in 40 hours per week what had taken 48 hours. This means an increased leisure time for the industrial operative, one of the most vital and valuable indications of the effect of a reduced liquor consumption. So that, however much 'bootlegging' there may be among the upper and possibly idle classes, certainly the vast proportion of industrial workers have reduced alcoholic indulgence to a minimum.

It is recognized that the Trade is not only productive of much harm, but non-productive in a much wider sense. According to Board of Trade Returns, 1924, in the brewing and malting trades, the net value (*i.e.*, selling value) of their output, was £130,764,000, less £75,826,000 excise taxation. The number employed, 86,456; net value of output per person (less excise) was £1,147. Of these 86,456, 73,785 were wage earners, according to Labour Statistics, 1928, averaging 53s. 11d. per week; they therefore earned £10,309,414 in wages. In other words, of every £100 in output value, £18 went in wages. A certain amount of course also in salaries, but there are no figures.

Now compare this with iron and steel smelting, rolling, etc.: the net value of output was £44,175,000; the net value per person employed was £202, which for 200,181 wage earners at 61s. 6d. a week means a wages bill of £32,008,940, or, out of every £100 output, £72 went in wages.

The figures for other parts of the Empire are along the same line and are interesting.

'All trades' in Australia realized a selling value of £344 per person employed and yielded £55 in wages for every £100 of selling value.

Engineering trades gave £318 per person and £68 out of £100 for wages. The Trade had £1,011 net value per person, and out of £100 wages cost £29.

In Canada:

786 printing works yielded $2,159 per head, and of each $100 wages and salaries, $59.
529 clothing factories yielded $1,616 per head ,and of each $100 wages and salaries, $63.
57 breweries yielded $4,755 per head, and of each $100 wages and salaries, $29.

(*Australian and Canadian Year Books.*)

In view of these and a host of other facts, we listen to Lord Meston in the House of Lords (21st June, 1927): "We are rapidly approaching the point at which this nation has to choose between the interests of the liquor trade and other interests, particularly those of the textile and manufacturing industries of England. England has during recent years lost some measure of its predominance in those great manufacturing industries, and it has to fight every inch of the way to avoid further retrogression. In that fight it has to throw overboard, ruthlessly and relentlessly, every handicap that stands in its way. One of the most prominent of those handicaps is alcoholism. It is no use talking of our personal feelings, about whether we are at our best under the genial stimulus of port or at our best under the colder stimulus of barley water. Actual physiological facts published by the Medical Research Department tell us without hesitation or reservation that for any form of sustained labour, whether mental or manual, alcohol is a deterrent. It is just that fraction that alcohol absorbs in the efficiency of our manufacturing worth that may turn the scale between our holding our own in the fierce competition of to-day or falling back for ever into the second rank." (*Parliamentary Debates, House of Lords*, vol. 67, No. 43.)

From this passing glance at industrial life we turn lastly to:

(*e*) *The Relation of Alcohol to Accidents.*—Here we are met at the outset with the difficulty that alcohol as a cause of accidents is rarely mentioned in official reports. Many may be due to alcohol where the fact is neither mentioned nor perhaps even suspected.

One thing is clear, accidents have been largely reduced in industrial life in the last 15 years. 'Safety first' principles and improved industrial conditions, more carefully guarded machinery, have all borne their share in the improvement. At the same time, there certainly was a relation between 'drink' and accidents in pre-war days and during the War. Dr. H. M. Vernon, whose classical work is so well known, refers to the question in 'The Health of Munition Workers,' Report No. 21, and in 'The Alcohol Problem' sums up his experience very tersely. Speaking of certain accidents, he says "they dwindled as the average consumption of alcohol dwindled" (page 233).

Most of the statistics directly bearing on the question are pre-war figures, and consequently, except, as a warning, are rather out of date.

Dr. T. Voionmaa, of the International Labour Office, Geneva, read a paper at the 1926 Congress against alcoholism, on alcohol and accident occurrence. Most of his figures were pre-war, but so far as they went they made a strong case. He referred to the fact that Switzerland has enacted legislation for compulsory insurance of workers against accidents outside employment. The Director of the National Insurance Office states that the abuse of alcohol plays a great part—it may almost be said a preponderant part—in insurance against non-industrial accidents. The outstanding feature of the statistics concerned is, however,

the extraordinary severity of accidents due to drunkenness. Except motoring accidents, which form a class apart, they are by far the most severe accidents, the average cost of compensation per case being 1,273 francs, *i.e.*, 160 per cent. higher than the average cost for all accidents covered, 484 francs.

In Great Britain, in 1911, in shipping, factories, docks, mines, quarries, etc., the number of fatal accidents was 0.6 per 1,000 persons employed; in 1926 it was exactly one-half—0.3 per 1,000 persons employed. The non-fatal accidents dropped slightly from 57.4 to 51.9 per 1,000. In Great Britain and Ireland, fatal shipping accidents have dropped from 1,234 in 1911 to 636 in 1926 (Great Britain and North Ireland), *i.e.*, from 2.0 to 1.6 per 1,000 employed. It is interesting that according to Fleet-Surgeon Home (*Lancet*, July 7th, 1928), there has been a marked fall in deaths due to alcohol among seamen, from 0.91 per 1,000 in 1901 to 0.21 in 1926, while deaths from all violence have fallen from 7.4 to 3.1 per 1,000. The decreased drinking among seamen is, in a measure, witnessed to by the returns from the United States Marine Hospitals Board, which operates 150 hospitals on the Atlantic, Pacific, and Gulf coasts, and on the great lakes and rivers.

1925: Patients, 31,908; alcoholic cases, 240; deaths, 1; drug addicts, 30.
1927: Patients, 33,531; alcoholic cases, 283; deaths, 1; drug addicts, 8.

In the Marine Hospital, Boston, in 1925, with 1,464 patients there were no drug addicts, 7 acute or chronic alcoholics, and no deaths; in 1927, 1,759 patients, no drug addicts, no deaths, 5 acute or chronic alcoholics. The superintendent says there were 17 cases in 3 years, 1925-27, all but two were over 40, old alcoholics in for acute exacerbations, and adds: "Opportunities for obtaining drinks

about Chelsea Front are probably not excelled at this time at any of our ports, yet alcoholic cases were three-quarters of 1 per cent. in 1925 and four-fifths of 1 per cent. in 1927."—not so bad for a country making a great social experiment, and a side-light on the value of a restricted liquor supply.

Coming back to our own country, in the 1928 Annual Report of the Chief Inspector of Factories and Workshops there is a list of all accidents and an analysis of the causes. Certain of the causes are interesting.

CERTAIN INDUSTRIAL ACCIDENTS, 1927
(TOTAL OF ALL REPORTED, 156,974)

Nature of Accident.	*Averages. Per 1,000 Accidents.*		*The Trade. Per 1,000 Accidents.*
	Non-Textile.	*Textile.*	
Persons Falling -	112	132	215
Handling Goods -	210	86	283
Septic Poisoning of Accidents under other Headings - -	98	181	107
% of Sepsis fatal	0.29	0.11	0.43

The two noteworthy points are, first, the number of accidents due to persons falling, and the percentage of sepsis which proved fatal in the three groups. The data are not given for a full analysis according to population at risk. Some individual trades, like shipbuilding, boilermaking, constructural works, etc., have a heavier death and accident rate than 'the Trade,' which is naturally to be expected. We have worked out from Labour Statistics (for 1927), and Board of Health returns, these provisional figures:

	Employed.	*Accidents.*	*Per Cent.*
Cotton Spinning and Weaving - - - -	501,821	9,297	1.8
Gas Works - - - -	108,421	2,365	2.1
Tobacco and Matches -	44,510	417	0.9
Electric Generating Stations - - - - -	46,736	869	1.8
Aerated Water Factories	18,217	188	1.0
Milling - - - - -	34,520	628	1.8
Brewing, Malting, Distilling - - - - -	70,622	2,138	3.0

What share alcohol has in all these, and the motor and road transport accidents, no one can really say. All the available evidence points to its being a large one, due not to gross inebriation, but to just that interference with neuro-muscular control and alertness of judgment which turns 'the close shave' into a 'nasty accident.'

In this chapter we have faced the fact, looked at the facilities for its creation, and considered some of the evidence upon which the fact is based. The whole constitutes a clarion call to definite and continued State action and education, in view not only of the intrinsic hurt to national life, but of the ever-growing demands of international competition

CHAPTER X

ALCOHOL AND THE DURATION OF LIFE

THE facts and figures which have been brought together show the influence of alcohol *en masse* upon non-abstainers as compared with abstainers. These figures and the deduction from them is not seriously contested, but attempts have been made to *prove* that moderate drinking does not shorten life. Professor Raymond Pearl is often quoted in this connection, so we propose to consider necessarily briefly some of his writings and his general position. His latest complete utterance is in *Alcohol and Longevity* (Knopf & Co.), in which he deals statistically with certain members of a working-class community in Baltimore, U. S. A. In that book he states: "If both moderate drinkers and heavy drinkers in this sample population are pooled together, and the resulting group is compared with abstainers, the drinkers as a class have higher rates of mortality and lower expectation of life than the abstainers as a class. This result is in agreement with the experience of life insurance companies." Then, he claims something which would be, and has been, contested by critical readers of his book when he continues: "But it is fully demonstrated in this book that this result appears only because the impaired heavy drinkers are pooled with the actuarially superior moderate drinkers and bring down the resulting pooled average" (p. 226). Further, he says: "Moderate steady

drinkers exhibited somewhat lower rates of mortality and greater expectation of life than did abstainers. This superiority is not great in the male moderate drinkers and may not be statistically significant. But it certainly gives no support to the almost universal belief that alcohol always shortens life even in moderate quantities." In passing, we are surprised to read that Pearl thinks there is a 'universal belief' that moderate drinking shortens life always. Pearl, then, does not contest the fact of insurance experience, but claims that in his material of the dead and living spread over at least five generations the moderate drinkers exhibited lower rates of mortality.

A moment's thought will make one realize how exceedingly difficult it must be to secure accurate information as to the drinking habits of past generations in a cosmopolitan population such as Pearl deals with—indeed, how difficult to assess the drinking of any individual as to its degree of 'moderation.' Pearl thinks that because the evidence was gained in an investigation concerning tuberculosis the relatives were more likely to give true information.

In dealing with the whole question, we must first look at the way in which Pearl's present position was reached. His first communication which attracted attention in this country was his chapter in *The Action of Alcohol on Man*. There he dealt with an experience of 2,047 persons, all of whom were deliberately included because they were dead (p. 242). Two crushing criticisms from many quarters were focussed: (i) On the way in which he classified his material as to the alleged drinking habits. We say alleged, because he dealt there entirely with dead men and women and was dependent on the views of their relatives. The classification was of such a nature that the Alcohol Investigation Committee practically rejected his findings and said that they strengthened rather than weakened the value

of insurance figures. (ii) A much more serious criticism, and one which still holds, in part, was that he dealt with individuals who were dead, and in some cases had been dead for generations. His results were really as valueless and fallacious as those of Dr. Isambard Owen some years ago, in so far as they are applied to the settlement of the question of the influence of alcohol on duration of life.

As a result of criticism, Pearl published an article in the *British Medical Journal,* May 31st, 1924, and reclassified his material regarding drinking habits, and apparently added certain living subjects, although he does not definitely say how many. This reclassification seems to have removed some of the objections of the Alcohol Investigation Committee, but—and this fact is often lost sight of—reclassification of the dead does not make them living, and so the major criticism still remains, at any rate as to a large part of his material.

Then came *Alcohol and Longevity,* where, instead of presenting 2,047 dead cases, he now referred to 5,248, and tabulated 5,246 of them as consisting of 2,403 dead and 2,843 living, but treated them as a unit in his life tables. On page 94, he complains that this material has been criticized as abnormal, etc. As a matter of fact, nearly 3,000 cases were new material and therefore could not have been criticized. What was, and still is, criticized, is his unscientific and fallacious use of the dead, 2,403 of whom he still retains. Then, again, Pearl does not sufficiently realize that, in view of the great change regarding 'drink,' younger men are likely to be total abstainers in larger numbers than older men, hence it follows that, other things being equal, deaths among total abstainers will be at an earlier age than deaths among non-abstainers. This point was seized upon in the *Lancet* editorial, April 12th, 1924, when dealing with the subject.

Alcohol and Longevity is a most confused book to read, and in view of certain explicit statements, one is never sure what Pearl is really dealing with.

Thus, on page 93, he says: "In the constitution of all the life tables in this book, without any exception or reservation whatsoever, the exposure to risk has been calculated on the basis of all the persons in the experience belonging to the categories under discussion, including both those living at the time of the record and those dead." But, as a matter of fact, on page 105 he leaves out: "those who changed their habits as to drinking"; on page 106 he leaves out all persons under 30 and, "this," says the *Lancet* reviewer, "is unsound"; and we can understand the criticism because it eliminates 27,241 person-years' exposure out of 91,853 years in his whole material.

Then again, when one studies his material closely, the constant change in life-expectation figures with the reclassification of his material is somewhat bewildering. Thus, in *Alcohol and Longevity,* expectation of life of males aged 30 was 36.34 (abstainers), but the reclassified material in *British Medical Journal* gives it as 37.1. Even if we take this higher expectation, the English experience is 37.4 for males and 40.3 for females, and that of the total abstainers, English Rechabites, is 39.1 for males and 43.0 for females.

Pearl devotes 16 pages discussing 81 individuals who are alleged to have changed their drinking habits. He states that the 'dead' heavy drinkers who became abstainers at an average age of 43¾ survived on an average 14.8 years, whilst the dead moderate drinkers who became abstainers at an average age of 41.7 years, survived 11 years. There were 20 such heavy drinkers and 8 moderate drinkers who thus became abstainers! After having devoted 16 pages to it, and engaged in the construction of a life table death rate on 32 males, he says: "The figures are too meagre to

warrant any conclusion." Precisely; and then he closes the chapter by deliberately saying: "All these 32 plus 49 others, 81 in all, have been omitted from the experience in the calculation of life tables according to drinking categories," which explicitly contradicts page 93.

Fortunately, Oscar Rogers gives plain insurance figures and experience not for 32 individuals, but for 6,241, who changed their habits from more to less drinking, and as a result, the actual deaths even then were 377 instead of 287 as were expected, showing clearly that the effect of alcohol tells even years after its use has been abandoned.

One of the most searching criticisms of Pearl's actuarial methods and work has been made by one of the most acute Continental specialists, Dr. H. Westergaard, of Copenhagen (*International Review against Tuberculosis*, 1924, and the *International Review against Alcoholism*, 1927, No. 3). After much criticism, he says: "Professor Pearl's investigations must be laid aside with a sigh of disappointment, the work not having given what it promised to give."

Coming to the essential points, we note, first, page 76. Here Pearl classifies his material. To simplify matters we will take only males (since doing so does not affect our main conclusions). There were 926 abstainers, 325 moderate drinkers unspecified as to frequency, 439 moderate occasional, 549 moderate steady drinkers, 845 heavy drinkers, a total of 3,084 subjects; of these, according to page 94, 1,548 were dead and 1,534 were living. (This is a discrepancy of 2, but that may be neglected.)

In Chapter V., page 112 fol., Pearl comes to what he calls the central problem of the study, "the mortality experience of different drinking classes compared."

The first table, No. xxiii., deals with the expectation of life, in years, in the specified group of males. He clumps together all moderates in one group, all heavy in a second,

and abstainers in the third, but leaves out all in each group under 30 years of age. The result is that the moderates have a very slightly higher expectation of life than abstainers, and both a very much higher expectation than heavy drinkers. All moderates being 36.75, all abstainers 36.34, all heavy 28.57.

So far so good, but a careful reading lands one in a difficulty. He had in his material 3,084 males, and on page 109 says that the person-years' exposure to risk in the present material (males) were 91,853.5. Now, when we turn to the table xxiii., to "the central problem of the study," we find that it is first made by dropping all males under 30 out of the picture; by so doing he reduced his person-years' exposure to risk by 27,241.

Subtracting then these eliminated 27,241 from 91,853.5 there should be 64,612 person-years' exposure to risk, but in the table which provides the first and pivotal point of his central study, we find 88,976 person-years' exposure to risk. Now, since he eliminated 27,241 under 30, and in the table eliminates those over 95, there should have been 64,598 person-years. The reader naturally asks what value can we give to a table which somehow incorporates 24,378 person-years exposure to risk? Where did they come from? Again, proceeding with the central study of the problem, Pearl deals with "Age Specific Death Rates and Expectation of Life for Males" (table xxviii., page 127), but only deals with moderate occasional and moderate steady group, leaving moderate unspecified out altogether; and uses age 32 instead of age 30, as he had done previously, which tends to confuse the issue. Leaving out 325 males with 10,763 years of life exposed to risk is a curious thing anyhow. We naturally ask, where are these 325, and what was their age specific death rates and expectation of life?

But go back to page 115, for there, speaking of the table

on expectation of life (No. xxiii., page 113), Pearl says: "The differences in favour of the moderates are probably for the most part, or perhaps entirely, too small to be regarded as statistically significant, having regard to the errors incident to sampling; in any case the table gives no evidence that the expectation of life from age 30 on is in any degree impaired by the moderate consumption of alcoholic beverages as defined in this book." That may be so, but we ask again, why leave out the 'under 30 years,' and why add 24,378 exposures, and where did they come from, and what are they? The whole of Pearl's figures run along very fine lines of difference, consequently these facts vitiate very considerably any conclusions whatsoever.

We proceed. After discussing matters which do not affect at all the main central problem or issue, Pearl sets forth table xxv., page 121, in which he shows the number of survivors out of 100,000 starting together at age 30 in the specified groups, and although he lumps his moderates together, there is evidence of impaired survival power under the influence of alcohol:

Age.	*Abstainers.*	*All Moderate.*	*Glover's Table for U.S.A. Cities of old Registration Area.*
30	100,000	100,000	100,000
35	96,152	95,878	95,010
40	91,995	91,496	89,415
50	67,686	66,887	57,548

Here the evidence of impaired survivorship is apparent.

Pearl sets out life table death rates (q.v.) per 1,000 life-years' exposure in the specified groups of males with this result:

At 30 years, the death rate for abstainers is 7.45; moderates, 8.14; heavy, 11.19.
At 50 years, the death rate for abstainers is 14.61; moderates, 15.01; heavy, 32.42.

After 60, abstainers have in this table a higher death rate than moderates, but after 60, the person-years' exposure are all very small.

Pearl recognizes "that the death rates for moderates are slightly higher than those for abstainers from 30 to 55, but, in his opinion, there is no statistically significant difference in the specific death rates in the range of age from 30 to about 70 between moderate drinkers and abstainers in this experience."

The final result of this central study seems to be that, with figures which are at least obscure in parts, Pearl shows:

(1) That based on the expectation of life there is a statistically insignificant difference in favour of all moderate drinkers over abstainers, as 36.75 is to 36.34.

(2) That taking the survivor rate, there is a quite appreciable balance in favour of abstainers up to 60 years (after that the fewness of years makes the figures of little value).

(3) That taking life table death rates (q.v.), there is an even more marked though still small balance in favour of abstainers, which Pearl says is statistically insignificant.

The result is that Pearl's strongest point is based on the weakest link in the chain. However valuable 'expectation of life' may be as a criterion of comparison in a general way, it is increasingly being put into a less prominent position. Indeed, the Government Actuary in "Life Tables," Part 1, Registrar-General's *Decennial Supplement* (1927), gives four methods by which mortality experience may be compared:

(*a*) Rates of mortality at selected ages; (*b*) Number of survivors at selected ages out of a stated number of births;

(*c*) Expectation of life at selected ages; (*d*) The probability of surviving an indicated period, say, ten years from attainment of selected ages. "Each has its advocates," he says. "In my opinion (*d*) of which (*b*) may be regarded as a variant is the best criterion of the character of a mortality experience, while (*a*) though less conclusive than (*d*) is superior to (*c*)."

So that the best criterion, applied to Pearl's figures, and incidentally the least obscure on Pearl's own statements, is the one which gives the greatest advantage to the abstainer as compared with the moderate drinker. We feel, therefore, that while Pearl's work and findings confirm the *en masse* experience of insurance companies, it does nothing really to prove that moderate drinking does not slightly but surely shorten the duration of life. Indeed, on the whole, Pearl's book leaves us much as we were, with more than a suggestion that moderate drinking points rather towards shortened than lengthened life.

Since *Alcohol and Longevity* appeared, an even more fallacious attempt has been made by Pearl and Bacon, in *Nature*, Jan. 7th, 1928, entitled, 'New Data on Alcohol and Duration of Life.' Here the authors deal with 518 abstainers, 1,309 moderate drinkers, and 791 heavy drinkers, a total of 2,618 males and females, white and coloured, who were a selection from 7,500 patients who came to post-mortem examination in the Johns Hopkins Hospital. These patients came into hospital over a period of 34 years, and all medical readers will realize that with a succession of resident medical officers and clinical clerks receiving these patients, the evidence as to their drinking habits is not likely to be very strong, reliable, or consistent. Apart from that, Pearl's main point is that the mean age at death of these patients was approximately the same for abstainers and moderate drinkers, and that in this material, therefore,

there is no evidence that moderate drinking did shorten life. Appearing in one of our best scientific journals, it naturally evoked a good deal of interest in certain academic circles, and I was severely 'heckled' on it several times by undergraduates. although, fortunately, the fallacy had been seen before the 'heckling.'

There are several points which rob this article of any value whatsoever as a real contribution to the question, 'Does moderate drinking shorten life?'

First, the material dealt with was not a random sample, but a highly selected population. Thus, the population of Baltimore provided the subjects; from these a first selection was made by disease, economic conditions, etc., and the subjects became patients in the hospital; then death made a selection and some died; then the pathologist and friends made a selection of the dead, and they were allowed to come to the post-mortem room; then Pearl made a selection of such of those as gave what he considered sufficient evidence in their 'case sheets' of their 'drinking' habits prior to death. He thus rejected 3,906 out of the 7,500 post-mortem examinations which were made. With such a highly selected series of cases, the sample is practically valueless for such purposes as Pearl and Bacon use them.

Further, it must be remembered, as Dr. T. H. C. Stevenson showed as far back as 1913 in his Annual Report, that hospital patients as a whole die at a much earlier age than the ordinary population. Among these young lives there would be, naturally and inevitably, a greater percentage of abstainers, with, consequently, a very fictitious mean age at death, for such a purpose as that to which these statistics are put by the authors. The *British Medical Journal,* which has been very sympathetic towards Pearl's work generally, says of this *Nature* article: "It does not appear to us that sufficient evidence is adduced to entitle us

to endorse the author's conclusions. . . . We do not see how any analysis of hospital deaths can either weaken or strengthen arguments based upon a knowledge of what the actuary calls the exposure to risk."

So then, we may say of this what Westergaard said of *Alcohol and Longevity,* the work does not give what it promised to give.

It is, however, interesting to note, that out of the 2,618 persons in this material who came to post-mortem examination, over 2,000 were drinkers and only 518 abstainers. There is one other recent paper by Pearl which needs notice. It is mainly a piece of biologico-mathematical work in vol. ii., part i. (1927), *Annals of Eugenics,* London. It is entitled 'The Constitutional Factor in Breakdown of the Respiratory System,' and is an investigation into the family history of 13 children of one man and his wife in Baltimore, each of these 13 children having had pneumonia at least once. In many ways it is a fine piece of intensive investigation. The family history is traced back through several generations on both sides and deals with over 200 individuals in five generations. The details of these individuals are given fairly fully in the case records. The point we wish to make is, that 'drink' and ill health, 'drink' and tuberculosis, 'drink' and rather loose living, occur again and again, especially on the father's side. Then, when Pearl comes to deal with his main point, the breakdown of these 13 children, not one single indication is given that 'drink' may have been a factor, nor is it even mentioned in the quite remarkable pedigree chart at the close of the article.

He shows that these 13 children had, on the father's side, a lineage where the infantile mortaliy was 14.0, and on the mother's side 3.7. There was far more 'drink' on the father's side. On the other hand, the mother's side had a

higher infantile respiratory illness rate of 3.9 compared with 0.8 on the father's side. Pearl suggests that, "the mother's people seem, as a group, more tenacious of life under a given degree of poor health pressure," which may be so, but then, quite irrelevantly it seems to me, he quotes Holitscher's statement, which by the way referred to adults, "that many more illnesses per death occurred among heavy drinkers than among the general population of moderate drinkers and abstainers." It is difficult to see what Pearl really dragged this in for, although it seems as if he uses it as a sort of evidence of tenacity of life!

The point, however, of the whole business seems to us, apart from abstruse mathematics, built upon very small numbers, to be, that here is a well-documented paper dealing with respiratory and constitutional breakdown, and yet apart from the references in the case notes, he never mentions in his findings one of the outstanding factors, viz. the possible blastophthoric or hereditary effect of alcohol, nor the environmental conditions that alcoholism can induce in a family circle, thus neglecting a serious vicious circle.

We have ventured thus to criticize these publications, not in any carping spirit, but because Professor Raymond Pearl, rightly, as many think, has a great reputation as a bio-mathematician, and there is more than a danger lest his statements, often qualified, should be used, as have been those of Atwater and Benedict, as if they were absolute.

Pearl's negatives are being twisted very often into positives, and although he would himself deprecate this misuse of language, readers of *Alcohol and Longevity* will feel that he himself takes far too much for granted and sails very close to the wind on page 129 when speaking of certain classes of moderate drinkers.

CHAPTER XI

CONCLUSION

As we look back over these fragmentary chapters, and at their background in *Alcohol and the Human Body,* we hope that abstainers and social workers will find in them points of value and even some confirmation of their convictions. We hope that others outside the ranks of organized 'Temperance' work will see in them a call to, perhaps, a new attitude of mind, or a fuller realization of the far-reaching nature of the fact and problem of alcoholic indulgence in our national life.

The centre of gravity has changed; drunkenness and gross excess is no longer the real centre of the picture, but rather the co-operating action of alcoholic indulgence, far short of so-called excess.

We have much cause for congratulation; various factors in association with the splendid work in our Bands of Hope and other temperance societies have produced a great change for the better. While 'to be as drunk as a lord' no longer has any meaning in English life, we also have to recognize that great numbers of artisans have found 'the easiest way out of Manchester' is no longer by resort to alcoholic euphoria. The great industrial classes have, to an enormous extent, emancipated themselves from the thraldom of drink. They are the classes who have come under the influence of systematic teaching in school and

societies; on the other hand, in those upper classes where definite education in this matter has been so neglected, the toll of drink in disease and death tells its own sad tale. It calls for an educational campaign throughout our public schools and the ranks of upper class society, even if the chief stress is thrown on the price of alcohol as deterrent rather than on education.

Alcohol allies itself only too easily with all the things which undermine the moral and physical integrity of national life. It is still responsible for a vast amount of broken life, which can never be stated in any statistical form. Modern science is constantly revealing the danger of even small doses of alcohol—the so-called physiological dose. Is there really such a thing? Is not its action always in a pathological rather than a physiological direction?

For many of us the evidence accumulates, until we hesitate to say that it is ever physiologically harmless.

Be that as it may, even if 'strictly moderate' drinking were proved to be physiologically harmless, our appeal is not fundamentally to personal physiological safety, but to public service; an appeal to 'give' to the larger well-being of national life, to protect youth and childhood from the recurrent dangers of custom and tradition.

Had I to make an appeal to a non-abstainer, I would say: "If you cannot follow us all the way, at least help us to protect and educate childhood; give us your sympathy, in the belief that at least it is the final good of the larger number we really seek."

If by any chance these words are read by my younger comrades in life, I would say: "If your parents will give their consent, postpone the date at which you even think of taking alcoholic beverages; postpone the date at least until you have entered manhood or womanhood, and then bring

the whole thing, in the light of your greater knowledge of life, to the bar of your personal judgment. Do not be an abstainer simply because some one else is, and do not embark on a perilous sea simply because some one asks you to 'drink'; but be what you are going to be, and do what you are going to do, because your own educated judgment tells you it is the wisest course."

For my own part, as thousands have heard me say, it is at the bar of an educated judgment we must bring and leave this vital national issue.

To all I would say: "Help us to give the children of to-day a better chance," and cannot do better than close, as I began, with the words of Horsley (as he left home for the Front), to whose collaboration with Dr. Mary Sturge we owe so much:

"Don't worry about me—I cannot live for ever—
It's the young who matter."

SYNOPSIS OF CHAPTERS

I. The Use of Alcohol in Medical Treatment.

pp. 1-14.

Confirmation of previous evidence—*The Practitioner*, Alcohol Number—Sir Humphry Rolleston's cautious statements—Alcohol Investigation Committee's report—Illusions concerning alcohol—The British Medical Association Meeting, July, 1927—Professor John Hay and pneumonia—Alcohol in medical practice—Alcohol in fever hospitals—Dr. J. D. Rolleston's experience—Metropolitan Asylums' Boards—Mental hospitals—Seven great London hospitals—Liverpool experience—Drug addiction—U.S.A. facts and figures—Methylated spirits, deaths and drunkenness—Medicated wines.

II. Alcohol, Its Effect on the Nervous System.

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(*A*) The narcotic action of alcohol—The testimony of Alcohol Investigation Committee—Late Professor Starling—W. E. Dixon—Sir James Crichton Browne—Sir Charles Sherrington—Sir Maurice Craig—Experiment versus experience—Alcoholic euphoria and anæsthesia.

(*B*) Alcohol and neuro-muscular system—Actions automatic and voluntary—Dodge and Benedict—Practical bearing of knee jerk tests—Vernon—Miles—Hollingsworth—Diner—McDougall.

(*C*) Alcohol and emotional life—Mental balance—The cortex and basal ganglia (optic thalamus)—Man's prerogative—Sir Henry Head quoted—Evidences of effect of alcohol:

(i) Crime.
(ii) Suicide—Registrar-General's Supplement; its general plan explained.
(iii) Cruelty to children—England and Wales—Scotland—Arresting figures.

(*D*) Degeneration and disease of nervous system—The Board of Control (Lunacy)—Five principal forms of insanity—Alcoholic psychoses—A great reduction in recent

years—England and Wales—Ireland—Scotland—A comparison— A necessary caution—Some Continental experiences—Recent German experience—American figures—Great decrease since 1910—Alcoholic cases in hospital.

(*E*) Alcohol and epilepsy—Factors in causation—Discussion—European and American Experience—Remarkable statements of Aldren Turner and Muskens—Alcohol and mental deficiency.

III. The Action of Alcohol on the Skin. pp. 59-62.

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